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Introduction to the Proceedings of the 1998 Government Learning Technology Symposium

Lisa Nelson, Environmental Protection Agency, Symposium Founder

The Symposium

The third Government Learning Technology Symposium was held on January 21 and 22, 1998, at the Kellogg Conference Center at Gallaudet University in Washington, D.C. The purposes of the Symposium were to provide an opportunity for Federal agency personnel to learn about existing learning technology capabilities and current developments that can be shared among agencies, and to enable participants to build relationships with colleagues within the government.

The two-day event started with a keynote presentation, followed by 36 presentations offered in five sets of concurrent 90-minute sessions, all delivered by Federal agency personnel. About 250 people attended the Symposium, from more than 35 different Federal agencies.

The Symposium was an inter-agency effort, sponsored by the Human Resources Development Council, the Centers for Disease Control and Prevention, the Defense Acquisition University, the Department of Energy, the Department of Veterans Affairs, the Environmental Protection Agency, the Federal Aviation Administration, the Graduate School, USDA, and the United States Air Force. The Symposium was planned by representatives of the sponsoring agencies, and conference logistics were coordinated by the Graduate School, USDA.

The Proceedings

This document presents the proceedings of the Symposium. These proceedings were created to help to extend the impact of the event by spreading the information shared at the Symposium beyond those who attended, as well as to enable those who attended to learn from the sessions that they were not able to attend. Accordingly, this document includes detailed presentation summaries, presenting the key points and describing the major methods of presentation for each session. Contact information for presenters is provided at the end of each summary. The summaries, which were written by journalists, were provided to the presenters for their review and approval prior to publication.

I know that you will find the information in these proceedings to provide a very useful overview of state-of-the-art Federal training capabilities and resources, and that you will also appreciate the "lessons learned" that were shared by many of the presenters.

Government Learning Technology Symposium 1999

If you would like to be involved in the next Government Learning Technology Symposium planned for Spring of 1999, as sponsor, presenter, or participant, please contact me at the Environmental Protection Agency, National Enforcement Training Institute. My E-mail address is nelson.lisal@epamail.epa.gov, and my telephone number is 202-564-2632.

Keynote Address
The Real Value of Technology in Education: One-On-One Learning By Doing

Roger Schank, Ph.D., Institute for the Learning Sciences, Northwestern University

Session Overview

As the keynote speaker, Dr. Schank challenged the audience to consider how to **really** use computer technology to help people "learn by doing" in both education and training settings. In this session, Dr. Schank discussed the various ways in which computer technology can and should be used in corporations to facilitate learning by doing, including:

- Capturing and delivering corporate memory
- Building meaningful simulations with opportunities to practice and learn from failure
- Providing a means for storytelling.

To demonstrate how software applications can teach learning by doing, Dr. Schank showed two examples of training programs developed at the Institute for the Learning Sciences (ILS).

Capturing and Delivering Corporate Memory

After discussing the concept that people learn by talking to other people, Dr. Schank described how to develop simulations that teach important lessons as stories, told by real people throughout the corporation or by experts in the field. Dr. Schank contrasted the "usual" knowledge delivery methods ("tell 'em, make them read about it, watch a video, test 'em") with the way that people naturally learn—by developing an understanding through repeated trial and error. Humans engage in "The Understanding Cycle" millions of times a day, which leads to learning. Learning occurs in the following way:

- We have expectations about everything.
- Our expectations fail all the time.
- We wonder why the failures occur; we question why.
- Our questions lead to explanations.
- We are then reminded of similar situations, or of a story.
- More questions are raised, which leads us to modify our expectations.
- When we modify expectations, we generalize and form rules and principles.

Building Simulations

Effective simulations should reinforce procedures through "scriptlets," or little patterns in behavior. Simulations should allow learners to learn from the instances when the procedures fail, to learn new cases that explain the failures, and to learn the facts that are needed to perform the procedures. Simulations must show all possible situations, and reflect all possible reactions and

responses. Learners should be able to view their strategic options, weigh solutions and tradeoffs, and see the results of their actions in a simulated environment. There should be no right answers; instead, build a database consisting of the best, real world stories, told by experts, experienced peers and novices, and even customers. Within each system there should be dialogues among experts; and, learners should be able to select a question that is answered by a variety of experts and other appropriate storytellers. The goals should be to present a variety of perspectives, linked to expert stories, that addresses each option the learner chooses to allow the learner to see how each decision plays out.

Demonstration of Software Programs

To demonstrate how computer applications can teach learners to learn by doing through simulations, Dr. Schank and Dr. Kemi Jona, a research faculty member at the Institute for Learning Sciences (ILS), demonstrated two programs.

The first program, *Community Partnering*, was developed for the Environmental Protection Agency (EPA). In this simulation, the user played the role of an EPA coordinator in a fictitious town, who needed to learn the skills to gain community consensus on an environmental issue. The program simulated all possible situations, perspectives, reactions, and responses. When a decision needed to be made, the user could explore every option and experience the results of that decision path through stories told by real people and questions answered from a variety of perspectives.

The second program, *Target Guest Services*, was developed for the Target Corporation. In this simulation, the user played the role of a Target Guest Services employee, who needed to learn how to respond to and assist customers in various situations. Each scenario presented a "problem" customer; the user had to select the correct responses to deal with the customer's problem or need. In contrast to the EPA software, which had no right answers for the user to discover, in this program, there were very specific correct answers that the user had to select before being allowed to move on.

Development Tools

According to Dr. Schank, specialized development tools such as those built by the ILS and the Learning Sciences Corporation are required to create programs that allow real learning by doing. Dr. Schank feels very strongly that the generic development tools currently in use can only create linear, presentation programs. Specialized tools must be created for educational use; tools that allow the learner to make real choices, to explore how each choice plays out, and to learn through stories, deeper levels of research, questions, and real answers provided by credible people within the organization.

"Learning by Doing" in Simulations

According to Dr. Schank, learning will be internalized through practice, making errors, repeating patterns of behavior, and learning through cases why something succeeded or failed. Learning has to be internalized through failing and learning from the failures.

Storytelling

According to Dr. Schank, to effectively use stories to help people learn, it is important to keep in mind that—

- People respond well to stories.
- The breadth of stories that we have as a culture is what we have to teach.
- Learners are ready to hear stories only when they **need** to hear them.
- Real simulations require real stories.

And, to deliver a consistent message, we need to deliver the same stories to everyone. One problem inherent in many training or educational programs is that everyone has different experiences. Too many random things happen that are important learning points for all learners to experience.

Goal-Based Scenarios

To really re-think the way we teach people to learn, we need to transform learning by telling into learning by doing, and educating on schedule into educating on demand. Dr. Schank talked about how "goal-based scenarios" can help achieve this transformation. Goal-based scenarios have the following characteristics:

- Clear and agreed-upon goals up front
- No preaching–only teaching
- Teaching occurs only after failure
- No telling–instead, learning by discovery
- Success is clear to anyone in the course
- Role playing drives learning—the learner should always be role playing.

In addition, a good goal-based scenario must have—

- Lots of experts
- Simulated clients
- Coaches instead of teachers
- Realistic goals
- Teams built into the scenario
- Reflection time
- Rewards for innovation (only if the corporate culture accepts it).

And, an organization must tell its stories to the right person at the right time.

Conclusion

Dr. Schank concluded his address by saying "That's all there is to education . . . there ain't no more."

Discussion

Maintenance Training

An attendee asked how maintenance training should be taught. Dr. Schank stressed the need to allow the learner to practice again and again, building in slight variations each time. Learners should be made to feel it is acceptable to practice as many times as they like.

Edutainment Versus Education

One attendee said the demos reminded him of an interactive game; that it seemed like "edutainment." Dr. Schank reminded everyone that our goal is to want people to "do education." Our goal should be to find out what it is about games that makes people want to play them and then to apply that to education and training. Education and training should be and can be as compelling as video games.

Impact of Learner's Age on Use of Computer Technology

An attendee was interested in knowing if Dr. Schank had any knowledge or experience with research showing that younger learners are more willing to use this technology and will therefore learn more than older workers. Dr. Schank agreed there is resistance to the technology for certain ages and that we always run that risk. He stressed that the issue is good software design; to design programs that are seamless, easy to use, and that do not break.

Value of Printed Documentation

An attendee asked if there is any value to providing printed documentation to go along with a program. Dr. Schank said the real issue is to get learners to go on and practice more scenarios, not read extraneous material. Dr. Schank stressed never tell the learners to go read the manual; instead, get them to internalize the material by practicing more.

Access to Experts to Ask Additional Questions

An attendee wanted to know if there is a way to tie in access to the experts shown in the programs so that learners could ask individual questions that were not addressed in the program itself. Dr. Schank responded that access depends on the corporate culture and what that culture will allow. E-mail allows more access than we have ever had before.

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Redefining Traditional Training Expectations: Stretching Training Dollars Technologically

Kathleen M. Mott, Federal Aviation Administration

Session Overview

This session was designed to give participants an overview of how the Federal Aviation Administration is using different training technologies to address the challenges of training a diverse workforce located throughout the entire United States, and how the FAA is replacing traditional classroom training with technology training. Ms. Mott spoke of the advantages and disadvantages of Internet-based training, how the FAA is converting classroom training to computer based instruction and interactive video teletraining, and about a new media catalog that is helping to leverage instructional development work for technology training.

Background

The FAA is composed of a diverse workforce with training needs that vary by location and function. Air traffic employees need to learn things that are specific to their location. Air traffic managers want training that is localized and "just-in-time." The second largest group of employees, the Airways Facilities group, which maintains and fixes equipment, wants broad-based training delivered to employees all across the United States. These two distinct types of training needs have forced the FAA to devise strategies to deliver training effectively and efficiently to its internal customer base.

Current Use of Technology

Currently, interactive teletraining is used to distribute training and information to employees throughout the U.S. Satellite production facilities are located in Oklahoma City. The FAA currently uses desktop video communications for operational purposes only, not for training, although the hope in the future is to move some training to desktop video, because FAA managers are asking for it.

Computer based instruction is used extensively. The FAA is looking closely at using an Intranet to deliver training but has not yet done a lot of delivery over the Internet. Disadvantages of Internet/Intranet training still include:

- Waiting times to get onto the World Wide Web
- Security issues
- The fact that the Internet is not yet able to deliver the same graphics, sound, and interactivity potential as other types of training
- Downloads can take too much time.

Planning Technology Solutions

According to Ms. Mott, it is important to consider a mix of technologies when putting together solutions that will work for the unique needs of an organization. Internet training, for example, can be used in many different ways—to deliver a full computer based instruction course, to allow synchronous learning through a chat room, and to allow for questions and answers as follow-up for classroom training. All technologies used in the organization's training mix should support each other. The FAA currently has an educational technology team that is working on future distance learning strategies. The team probably will recommend a number of different technologies to fill the needs of FAA managers and employees.

Some of the lessons the FAA has learned about approaching technologies for learning include—

- Identify your customers and get their buy-in as a first priority.
- If you are converting training to technology-based solutions so people don't have to travel, you have a problem if they still have to travel. If your center to receive satellite-based training is 50 miles from the office of the individuals to be trained, you may be diluting the effect of the technology-based solution.
- Technology is not the answer if the training need has not been identified in the first place.
- Documenting your customer's needs once is not enough. The needs will change, so you need to go back and document through the development phase in a continuous loop process.
- Share what has already been developed across the organization. Don't reinvent the wheel.

The FAA Media Catalog

The FAA media catalog is a developer's tool created to provide access to graphics, photographs, animation, video clips, audio clips, models, templates, and other reusable objects through a database and search engine.

The catalog was developed to serve FAA instructional developers in 126 locations throughout the United States. These developers can work faster and more efficiently if they can access tools for the development of software from a central location. The thought was that, if the FAA had already paid for media clips through their developers or contractors who were doing developing, the media could be reused in different places for different audiences. Development thus would be cheaper and faster.

The catalog uses a search engine to access the different clips that FAA has purchased or that have been used previously in FAA technology delivered training. A help screen shows how to initiate searches, and answers frequently asked questions. It also has a place to access tips for use, and what's new and hot. Users can search by categories, key words, and type of media. The search will tell users what format the media exists in (for instance, for art the user could specify bmp or pix format), and will give the user a thumbnail pictorial representation of visual clips, as well as the specifications such as file size and format, the developer, and the company that owns the art.

These media clips have been purchased by the FAA and can be used by any government agency. This is clearly stated in copyright and contract law, and is specified in the contracts as "full, unlimited use" when purchasing outside developers' services. FAA developers are licensed to use clip art from clip art books that are accessible through the catalog. The authorized catalog user can access the database over the Internet and download desired art to his or her PC.

Because software for development changes so quickly, and different developers use different products, the FAA is also creating a "jukebox" to house development software on a computer in Oklahoma City.

Discussion

Catalog Cost

A participant asked what it cost to put the media catalog together, and how long it would take to pay off the development costs of the catalog. Ms. Mott said that contractors were approachable and accommodating about using some of their work as clips, and helped to identify clips for the catalogue. Employee developers were actually less cooperative, but eventually the FAA group identified enough material to be loaded into the catalog. The cost to have the information encoded, sorted, and loaded into the database was about $8,000. The group started with 600 pieces of art, which developers will add to as they develop additional FAA training.

Ms. Mott advised the group that the specifications for the catalogue, as well as a study done by the FAA on technology trends for learning, are available from her via an E-mail request. She said the FAA would consider giving clips to agencies within the Federal government that wished to develop their own media databases.

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The Intelligence Community and Law Enforcement Agencies CBT

Anita Knisbacher, Department of Defense

Session Overview

This session demonstrated metaphoric representation in computer based training (CBT) lesson design. Ms. Knisbacher identified several tools and methods to sustain the interest of the adult learner and convey information in dynamic, retention-sustaining methods.

Ms. Knisbacher emphasized the need to use the right training tool for the audience. She displayed multiple methods to generate learner interaction in the CBT. The goal, she said, is to put topics at the fingertips of adult learners.

Background

Ms. Knisbacher showed an interactive course designed to give law enforcement and intelligence communities a chance to learn about each other so that they can work effectively together. The CBT was commissioned by the Joint Intelligence Community and Law Enforcement Community Working Group. Two distinct information segments were available throughout the CBT course so that representatives of either community could find out more about the other and test their knowledge about their own organization. There were two subject matter experts, one from each community. The two representatives were asked to reach consensus opinions with others (fourteen total) in their community in order to bring subject matter expertise to the project.

Interface Design

The CBT course is metaphor based. It uses graphics appropriate for the subject to convey the information and move the learner through the course. Starting with a room decorated as the study in a house, each of the visuals is an icon for a course module. The individual modules that pertain to each community are represented as books on two bookcases in the room. Clicking on the brown volume in each bookcase displays the objectives of the modules. Moving the cursor over the visuals in the room shows the title of the module or the purpose of the icon. For example, the globe is an overview of the course.

Ms. Knisbacher favors visuals with undefined edges. The designer frequently used masking to produce soft graphics. The visuals consist of either a picture, a collage, or a screened background. The visuals are topic appropriate and add to the information being conveyed.

Designing for the Adult Learner

Stand-alone topics. Ms. Knisbacher expressed her belief that, whenever possible, the adult learner should be able to choose his or her own topics and the order in which they are studied. To

keep the learner's interest, she frequently introduces elements of surprise in the learning materials. For example, in the module, *Criminal Threats to the U.S.*, there is a view of the White House. Close examination shows a werewolf in the clouds above the White House ready to attack. In another module on defusing bombs, the visual is of a man with his hands over his ears stepping on a "live" old-fashioned round bomb. Ms. Knisbacher cautioned that you have to be careful using too much humor in CBT, but used sparingly, it can be effective.

Building interactive segments. Each screen was created to be user friendly. Keeping in mind the adult learner, Ms. Knisbacher used a variety of feedback techniques. Sometimes, selecting the right graphic and seeing a flashing green frame around it is enough feedback. If the learner answers incorrectly, the screen indicates that the answer was incorrect and provides the correct information. The purpose of the CBT is not to test the learner, but to convey information. For this reason, she did not ask the learner to try repeatedly until the correct answer was selected.

Each module asks the learner to select the correct answer in a different manner. Some were straight multiple-choice questions. The learner clicked on an answer and the screen indicated whether the answer was correct. If not, the correct answer was provided. In another module, the learner selected a picture that best answered the question. As another example, the learner had to drag and drop the answer in a sentence. Incorrect answers did not "stick."

As an example of the user-friendliness built into the CBT, one module asks the learner to read a scenario. On the next screen, the learner is asked to select the appropriate answer to questions. So that the learner does not have to switch back and forth between the scenario and question screens, the scenario is repeated in a small window on the question page. The learner can scroll through the scenario if he or she needs to review the details of the scenario.

The absolute maximum number of consecutive information screens that Ms. Knisbacher will build into her CBT is four. After the fourth screen she includes an interactive screen. She often provides interactions after one or two information screens.

Providing practice. Adult learners want to practice, Ms. Knisbacher explained. For this reason practice scenarios are built into each module. She also incorporates games, such as a pseudo Jeopardy game to provide additional practice. After selecting a monetary value in a category, the learner has a set amount of time to answer the multiple-choice question. A correct answer generates points; an incorrect one takes points away. A "bonanza" square asks the learner how much he or she wants to wager. The game can be set to beginner, intermediate, and advanced levels.

Reinforcement and progress. Each topic ends with a bulleted summary page that recaps each point made in the module. This information is on one page. The MAIN MENU doubles as a progress map.

Putting information at the learner's fingertips. Ms. Knisbacher incorporated a browser and glossary in the CBT to enable learners to quickly find information on a specific topic. The browser contains the most frequently asked questions and corresponding answers. Clicking on

the telescope (the browser icon) brings up a screen that looks like a computer monitor and keyboard. The highlighted keys on the keyboard are active. Clicking on the R key brings up questions that have an R word, e.g., "What are responsibilities of DIA?" The answer then appears on the screen. Clicking on return on the screen's keyboard returns the learner to the previous screen.

The glossary is displayed as a clipboard with highlighted letter keys. Clicking on a letter brings up a list of subjects that begin with that letter. The learner then selects a topic and available information is displayed. Ms. Knisbacher scanned in documents from different sources to provide additional online sources of information.

In addition to these tools, the CBT includes an overview that appears automatically for first-time users. The learner can click on a button to bypass the overview during subsequent study. The overview explains the navigation paths through the course and the icons.

Simplifying Troubleshooting

The "?" icon brings up a technical help menu. Clicking on the Screen ID option brings up a label on each screen that provides the file name and screen number. This information helps the programmer easily identify the location of the problem via online Technical Problem Reports. This is particularly helpful for the reviewer, Ms. Knisbacher explained, who can toggle back and forth between the module screen and report.

Discussion

Creating the Metaphor

Audience members complimented Ms. Knisbacher on the use of menus and pop-up screens in the CBT. They also found the metaphor-based icons interesting. Ms. Knisbacher described development as a team effort. The metaphors were conceived through team discussions. She noted that the multimedia development group in her organization is using the room metaphor for other CBT, but is changing the furniture and décor to match the Chinese subject matter.

Use of Audio

When asked why the CBT did not include an audio component, Ms. Knisbacher explained that they stayed away from audio because of bandwidth problems. The course without audio is 51 MB. It is available on floppy disks as well as a CD-ROM.

Working with the Subject Matter Experts

Ms. Knisbacher was also asked how she streamlined the subject matter experts from 14 to two. She explained that she requested liaisons who then talked to the other subject matter experts. They were responsible for course content. The content outline she received included bulleted topics. She then used her imagination to modify the content for the online version. She also

prepared an instructional design report including milestones, screen conventions, student options, objectives, content description, and overall design. She also scripted the storyboards. As the designer, Ms. Knisbacher selects how the information is presented, puts together the interaction scenarios, and writes the screens.

Development Tools

The CBT was developed using 3-D Deluxe Animation Package and IconAuthor. She noted that the programmer had to send samples of code from trouble areas to an expert to be able to port from DOS to UNIX. The course is Web bound.

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Distance-Based Learning: Training Federal Staff in the Next Century

Karen White, Centers for Disease Control and Prevention
Victoria Rayle, Centers for Disease Control and Prevention

Session Overview

This session highlighted some unique and significant distance-based education methods used to provide training to Federal staff, and dramatized the important balance that must occur when maximizing the tangible and relevant learning outcomes during government training. The presenters discussed different aspects of the Centers for Disease Control and Prevention's Graduate Certificate Program (GCP).

Background

Ms. White presented a brief history of the Centers for Disease Control and Prevention (CDC), and how it has responded to the need to re-train its field staff in response to the evolving health-care environment. CDC's primary purpose historically has been to partner with state and local health departments to best use Federal resources at the local level. During the 1960s and 1970s, CDC's programs were Federally dependent, with few state employees; programs included such traditional activities as service delivery, client interviews for sexually transmitted diseases (STDs), case management, and program management. In the 1980s, while other Federal activities assumed an increasingly local orientation, CDC remained heavily involved with local health issues because of the spread of the AIDS epidemic. Unlike other Federal agencies, CDC grew, and the agency remained closely involved with local health-care systems, with its focus expanding to include health education and community outreach.

During the 1990s, however, there have been profound changes in the public health arena, that have entailed budget cuts and a responsibility shift from the Federal to the state level. By 1995, Ms. White noted, the CDC found itself with a downsized staff, many of whom were in mid-career, trained to do things states no longer considered priorities. CDC's staff, therefore, needed to undergo a revision in its thinking and practice, jettisoning the emphasis on administratively implementing mandates, and adopting more of a counsel and advisory role at the local level, providing technical assistance, policy development, and assessment.

This wholesale change, however, met with resistance from some of CDC's field employees. Re-training that field staff to respond to the evolving health-care environment was complicated by budget cuts, the obsolescence of some programs, and the decentralization of staff—whose professional and personal responsibilities, in addition, required that they be trained while on the job.

The Graduate Certificate Program

The Graduate Certificate Program (GCP) was the solution, Ms. White continued, developed and implemented in conjunction with four universities: Emory, Johns Hopkins, Tulane, and the University of Washington.

The idea behind this program is to target existing and evolving deficiencies in staff training with a core curriculum of classes:

- Epidemiology
- Biostatistics
- Communications skills—writing memos and reports, in particular.

The program also addresses some areas of particular need:

- *Information systems.* CDC has a large, complex, hard copy, data base; there is a need to upgrade the agency's data management tools and techniques.
- *Health education.* The public is no longer a passive consumer of its health-care information; instead of being summarily lectured, people now want to be active participants in their education.
- *Public health system management.* With shrinking staffs and resources, and ever-larger workloads, public health systems need to be more effectively managed.
- *Public health policy.* This is an already large and ever-expanding area; it is no longer effective to make policy based upon personal and anecdotal experience.
- *Emerging infections.* This is a particularly key component of epidemiology. Learning about diseases such as Ebola should not have to be done through disease intervention; instead, responses to emerging infections must be readied ahead of time.

Implementation. There was interest in this program not only from the CDC's field staff, Ms. White continued, but also from the agency's headquarters staff. All levels of Federal staff, as well as state and local health departments, have begun to see the value of this education and training. This program is changing how the public-health sector looks at itself, she stressed, as well as how it is perceived both by the public and by governments.

The Graduate Certificate Program at Emory University

Tina-Lynn Paul, who directs the Graduate Certificate Program at Emory University (GCPE), talked about the program. Designed initially to provide to CDC public health advisors a core set of skills, the program has now been expanded to include other public health professionals. In creating the GCPE, the aim was to take the skills and knowledge taught to graduate students in Emory's School of Public Health, and revamp the delivery of that information to meet the specific needs of a new student population.

By using the Internet as a distance learning (and low-cost) technique for delivering much of the instruction, the GCPE allows the staff ready access to the program while traveling, without their needing to be at a specific satellite downlink site. Students come to campus for six one-week

sessions, spread over the course of 16 months; concurrently, they participate in distance-learning via GCPE's Internet site, which utilizes eLearn™: a suite of technologies providing an interactive learning environment. eLearn™ uses a Lotus Notes environment that is user-friendly and easily navigable, and includes features such as audio recordings, discussion boards, chat rooms, E-mail, and test generators. Instructors have the flexibility to add content to a course as it proceeds.

In designing the program, Ms. Paul continued, Emory staff incorporated sound instructional design and adult-education principles, so that—

- The content would be engaging and relevant to the target audience of primarily mid-career professionals.
- The technology would not distract from the content.
- There would be ample opportunity for interactions both between students and instructors, and among students.

Web site demonstration. Ms. Paul gave a quick overview of the GCPE Web site. Features include—

- Basic program information on the first screen of the Web site
- Password protection, which not only secures the content, but also allows instructors to "take attendance" of the student users, and track students' movement and progress through the modules of the course
- A student lounge, with a directory of students
- Consistent instructional design among the classes
- Flexibility, allowing students to work ahead if their individual schedules so require.

Each lesson plan includes a basic summary, an overview of the assigned readings and assignments, and instructor notes. The audio component is a simple point-and-click operation, so that students do not have to open a separate audio package first. All courses begin on campus, and each student receives a reading list at that time; any subsequent readings that the instructor might choose to use are mailed out to students. Every class has a posted syllabus plan, and includes a discussion board on which students can conduct exchanges among one another that are not limited to real time. Students can meet in real time with one another, or with faculty during posted office hours, in an electronic chat room.

Evaluation of GCPE. This has just been completed, by both students and faculty, Ms. Paul noted. The findings include—

- Both students and faculty found the GCPE to be interactive.
- Students found the classes immediately useful and pertinent to their jobs.
- Students found it challenging to balance professional, personal, and school commitments.
- In general, faculty members believe they can utilize the program more fully in the future.

The staff hope to incorporate more video into the program, Ms. Paul said; currently, the rate of streaming of video over phone lines is a concern, in that if the video is not properly synchronized

with the audio, the lesson presentation can be distracting and the material lost. Emory owns the eLearn™ technology suite.

The Johns Hopkins University Program

Jim Stofan, an education specialist at Johns Hopkins University (JHU), described the JHU Graduate Certificate Program. He first explained the concept of audio streaming: a technique allowing transmission of an audio stream over the Internet, that does not require a receiving end user to have a lot of storage space in order to listen to it. The university is using this technique to deliver faculty member lectures. At the JHU School of Public Health, the content and programming used to develop the certificate program is proprietary to the university; much of the transmission software, such as NetMeeting, Netscape browsers, and NetAudio, is free. Video streaming is planned for the next year, he added; this year, only audio streaming is being used.

At the JHU Graduate Certificate Program, Mr. Stofan continued, there are 36 students currently enrolled, including CDC field workers, and a few international students. Both students and faculty members can access the program through the Internet. Since the geographic dispersal of students can promote a feeling of isolation, the students are partnered with one another to encourage collaboration. The JHU program has three on-campus sessions; these courses stress a team environment, allowing the students to work together when synthesizing the academic skills they receive during the off-site, distance-learning classes.

At JHU, the biostatistics and epidemiology courses have been combined into a new class called Quantitative Methods. It is a four-month, six-credit course, segmented into a series of eight modules. Successive modules cannot be opened by the student until a period of time has elapsed for completion of the prior module. There are specific times when teaching assistants are available on-line for real-time discussions with students; these discussions are archived for students who cannot participate in them in real time.

The software JHU uses is free shareware, Mr. Stofan continued, and it allows point-to-point voice conferencing. In addition to audio lectures, the program uses animations—for example, to illustrate difficult concepts such as prevalence in epidemiology. As the student works through the exercises, error messages encoded into the program bounce the student back to the accompanying lecture if the solution or answer is inadequate. As the student works further into the module, the data sets, and their accompanying questions, change to reflect the student's prior answers. This program is customized in CGI scripts; JHU will be using an Oracle data base and an Access data base.

The Tulane University Program

Martha Cuccia, Graduate Certificate Program Coordinator at the Tulane University program, discussed the organization of the program's Web site: it includes bulletin boards, chat rooms, discussion groups, and E-mail capability. It also contains faculty information, admission information and forms, and program and course information and schedules. She illustrated some of the features of the Web site. The student area is protected by passwords.

To facilitate the use of the site for distance learning, the program mails students resource packets prior to their on-site sessions, so that the students arrive on campus well prepared for the program. There are three cohorts of students scheduled for a three-and-a-half year period: the first round of students started the course work in July of 1997; the next cohort of students will have expanded sessions to complete their work.

There are three program tracks available, Ms. Cuccia continued: evaluation and surveillance, management, and community health. As students come from a variety of backgrounds, they are encouraged to share their experiences from their diverse disciplines when working on the program course work together.

Evaluation of the program has revealed the following, she observed:

- Smaller groups work best for the students.
- The school increasingly supports distance-learning technology.
- Using three separate cohorts of students allows the program to implement lessons learned from prior course presentations.
- Communication skills, as well as teaching and presentation skills, should be emphasized.
- Students have a varying familiarity with computers; therefore, there is a need to address this wide variance in computer literacy, and to outfit everyone with a basic level of computer understanding.

Lessons Learned

Ms. White reviewed some lessons learned from implementing the CDC GCP:

- In deciding to establish and implement the program by contract, rather than by grant or cooperative agreement, CDC could be more directive with the schools regarding what it wanted.
- The kind of coordination among the universities involved in the GCP consortium is very unusual in academia; using this kind of technology, as opposed to more traditional methods, allows all parties to cooperate and to be creative on program development.
- It is very important to maintain the integrity of a cohort—a class of students, competing through a merit process, who start and graduate at the same time. This fosters a supportive climate for the students, many of whom have not been to school for years.
- This kind of program minimally disrupts the workplace or work force; CDC does not support its field staff working on the program during their work time.
- The program is transportable; staff on travel can use their laptops to access the course practically anywhere.
- This is specifically tailored to CDC's specific needs; CDC does not own this technology, however. CDC does have the experience in developing this kind of program that could be valuable to other agencies.

- It is important to give those who complete the course a credential: undergraduate or graduate credits that are recognized as such and transferable.
- The program has led to an overall increase in the confidence and maturity levels of CDC's staff.
- The program is not labor-intensive. The start-up is where the work is; once the program is established, it runs itself.

Some of the challenges to creating such a program include—

- *The cost.* It is expensive to start this program up (approximately $15,000 per student), but it is still less than the cost to re-train an employee in industry. These costs can be managed.
- *Time requirement.* The course work requires the student to invest 15-20 hours a week; however, this program saves on disruption costs associated with traditional education that require the student to travel to a specific site much more regularly.
- *Learning curves.* There are several learning curves involved with this program: students have to learn computers, what it is like to be a student again, and quantitative skills.
- *Individual learning styles.* The program is not for everyone; some candidates just do not like, or do not feel comfortable with, computers, and are better attuned to long-term training centered around the classroom setting.

Discussion

Equipment and Materials

Since the whole point of distance learning is to afford the opportunity to hook in to the program at any time, Ms. White noted, CDC provides its students—a mobile staff that transfers and travels a lot—with laptops. CDC also pays for tuition, books, and materials. One of the benefits of this program is that CDC staff members can go to school while they work. Developing this GCP has also provided CDC the opportunity to change organizational attitudes towards education and re-training, as well as to promote overall familiarity with new technologies.

Staffing Support

Staffing support for the various branches of the GCP varies; at Johns Hopkins, for example, there are six full-time staff members, and other faculty members and teaching assistants are added as courses are identified. Courses take from four to 10 months to develop, with around five people developing each course. At Johns Hopkins, the program includes the ability for faculty to upload content directly to the Web page, content which is then adapted by the programming staff into a format that is consistent among all the program Web pages.

At Tulane University, there was initially some trepidation by faculty about developing this kind of program. It is important to get program developers involved as early in the process as possible; it is also important that there be a cohesiveness among those involved in the program, which will help both faculty and administrators grow more comfortable in this kind of environment. Distance

learning will be assuming an increasingly large role in education in the future; the technology looks very complicated, but in fact is relatively simple.

Costs

Costs are anticipated to diminish on a per student basis once economies of scale take effect. Much of the $15,000 per student cost is for tuition; the schools involved in the GCP have top-notch schools of public health. The laptops will be handed off to the next class. Costs will also be determined by whether or not the courses are for academic credit. All the participating schools in the GCP have a reduced rate for non-credit courses.

Accreditation

Resident and distance-learning courses have equal accreditation; there is a process where the courses have to pass muster with the individual school's academic standards committee. There is occasionally resistance to accrediting these courses due to their distance learning delivery method.

Benefits of a Consortium

The CDC chose four different university partners because each one offered unique opportunities and strengths. Such a consortium provides greater opportunities for the students, and in addition facilitates CDC's desire to push public health education.

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Using Models to Speed Quality CBT Production and Cut Costs

LCDR Richard L. Arnold, U.S. Coast Guard
Kimberly Kavanagh, U.S. Coast Guard

Session Overview

Compared with other organizations, the Coast Guard is a relative newcomer to computer based training (CBT). This presentation focused on the Coast Guard's recent experience with CBT, particularly the use of models and templates to streamline the production of courses. After reviewing the pros and cons of CBT, LCDR Arnold of the U.S. Coast Guard Reserve Training Center, Performance Technology Center, outlined the Coast Guard's needs and explained how models address these needs. Attendees saw brief demonstrations of two prototype modules and authoring tools/models.

Background

Training, which is very important in the Coast Guard, is an expensive undertaking. Units are scattered along the nation's coastlines, and travel expenses represent the largest part of the training budget—an estimated 80 cents on every dollar. The need to reduce expenses is driving the adoption of technology such as interactive video, computerized job aids, and CBT.

Pros and Cons of CBT

Organizations using CBT have found that it improves personnel performance by (1) allowing self-pacing, (2) keeping certain costs in check, (3) standardizing delivery to make lessons consistent, and (4) supporting just-in-time interventions no matter whether the trainee is in the office, aboard ship, or on the road.

The typical production of CBT courses, however, has drawbacks. These include high up-front courseware development costs, over-reliance on specialists (especially programmers), long development time, and high life-cycle (maintenance) costs. Because Coast Guard personnel must "qualify" for certain jobs by successfully completing different training courses, the Coast Guard must integrate a course management system (CMS) into its CBT programs. Among other tasks, CMS builds in safeguards to prevent cheating on tests and tracks the trainee's progress or lack thereof. This is an additional, time-consuming element for CBT developers.

Typical CBT development costs are often described as ratios, either development hours per finished CBT hour or development costs per finished CBT hour. LCDR Arnold's analysis of data from five different sources showed a range of 100 to 500 development hours per finished CBT hour. Depending on the fidelity of the package and the scope of the training, the number of hours can exceed 500; however, development hours generally diminish with experience. Data from the same sources showed that costs per finished CBT hour ranged from $60 to $8,000. When

questioned on this wide variability, Arnold explained that the low figure represented a course written using a presentation package such as PowerPoint and little or no interaction with the trainee. The high figure represented a very interactive, advanced course. He added that developers are starting to calculate CBT development costs based on the number of interactions per hour or screens per module.

The Coast Guard's Needs

The Coast Guard Performance Technology Center (PTC) believes that CBT should be a complete training package that enables users to access information and creates situations in which users perform required tasks. CBT courseware should provide extensive cues/stimuli, allow some degree of self-directed learning, be engaging, and be highly interactive. A complete CBT package should also document performance and provide remediation and testing.

Eager to save time and money yet still produce complete CBT programs that improve personnel performance, the Coast Guard searched for production techniques that would allow developers to create training products faster without relying on high-level programming expertise during the development stage or during post-production updates.

Streamlining CBT Production

The suite. The Guard has chosen to standardize CBT production by using a suite of products—a commercially available multimedia authoring tool (Authorware), a set of comprehensive production templates (models), and easy-to-use CMS software to provide feedback to supervisors. The suite documents the programming with notes and instructions so that if the original programmers leave the team, others can maintain or update the course. Acknowledging the existence of thousands of authoring tools, LCDR Arnold explained that the Coast Guard chose one that best fit its needs. In particular, Authorware incorporates Macintosh files into a PC platform. This tool does not, however, do virtual reality simulations. Designer's Edge was mentioned as a pre-authoring tool along with ToolBook II for rapid simulations.

The models. The four types of models used are (1) file setup models, (2) content development models, (3) router building models, and (4) test development models. The file setup model is the shell for each lesson. The content development model presents a self-contained instructional page that may include text, graphics, animation, audio, and/or learner interaction. The test model allows developers to build sets of questions, and the router model launches other individual files.

The handout that accompanied the presentation states that the learner information tracked by the PTC's commercially procured models includes—

- Name, site location, job title, team/group title, social security number, and identification number
- Start date (course, lesson, topics)
- End date (course, lesson, topics)
- Total time (course, lesson, topics)
- Number of times in the section (course, lesson, topics)

- Test scores
- Learner progress (checkmarks)
- Book marking (resume at last exit function).

The team and the prototypes. Because the Coast Guard cannot afford a huge CBT development team, most of the team members create courses on a part-time basis in addition to other responsibilities. Core team members include graphics/media designers, authoring tool/models developers, and instructional technologists. To test the authoring tool and models, PTC produced a 30-minute prototype gyrocompass training module in collaboration with a contractor, Multimedia Learning, Inc., of Irving, Texas.

Demonstrating portions of the module, LCDR Arnold pointed out that the Coast Guard has opted for reusable components such as the navigation icons and menus. For design ease, one screen appears, not multiple mini-screens. Wherever appropriate, standard content and standard technical graphics (gauges, for instance) are reused in CBT courses. All reusable components are replicated across the production stream.

LCDR Arnold noted that when the traditional gyrocompass course was being converted to CBT, two members left the team. Because the developers were using models, work proceeded without much delay. With some training on the models, subject matter experts and junior staff members can replicate the core team's work. The team also developed a two-hour prototype module about gauges for junior machinery technicians. The contractor is assisting PTC in producing additional CBT modules for this course.

Advantages of Models

From experience with the two prototypes, the Coast Guard has concluded that models support reusability, include a high number of variables and functions, can be replicated, and allow for rapid integration of changes or updates after product completion/release. Non-programmers can use the models to—

- Standardize the interfaces and the navigation so that development time is spent on the content of the lesson
- Customize the look and feel of the lessons
- Create a range of standard learning interactions and activities
- Create multiple path menus in a consistent, rapid fashion
- Reduce the need for expensive programmers
- Move quickly from design to development
- Create a standardized online index, glossary, and help section
- Build in standardized online book marking, note taking, and flash carding
- Facilitate rapid production of pre-, post-, and embedded test questions.

To emphasize the utility of models, LCDR Arnold demonstrated an authoring system without models. Developers may select from more than 20 icons along the left side of the screen to start the flow lines of the CBT course. This process is creative, but it is also time consuming and thus expensive. Moreover, the course routers must be custom programmed. He then showed portions

of the gauges prototype that were developed using models, noting that after one week of training, the core team felt comfortable designing with the models.

Discussion

Hardware Considerations

An attendee commented that hardware changes can affect software decisions. Agreeing, LCDR Arnold explained that the Coast Guard has a homogenous operating system—Pentium processors, Windows NT, and CD-ROMs. Sound cards may not be available in every Coast Guard computer. The Guard recently converted to PCs and is just beginning to use an Intranet. Therefore, training courses will change first at the resident training facilities (the "schoolhouse") and later at the remote sites or stations.

Web Delivery

Asked whether the gyrocompass prototype is available on the Web using Shockwave, LCDR Arnold confirmed that it is but that some users have experienced bandwidth problems. The MISLS project is responsible for developing training courses for the Internet.

Working with Contractors

Several attendees asked about keeping the contractor's product on target when collaborating on a CBT course. LCDR Arnold said that the PTC core team analyzes the current course, does the story boarding for the CBT course, and develops a module or two. Provided that the analysis phase is comprehensive, the test runs of the early modules usually show where content changes need to be made. PTC may then turn the bulk of the production over to the contractor. At intervals throughout the production stage, he and the instructional technologist visit the contractor, test the modules, and advise developers on changes. Solid up-front analysis and regular product review during development help prevent "mission creep."

Getting "Buy-In"

An attendee asked about resistance to the use of CBT in general and models in particular on the part of trainers, subject matter experts, and supervisors. Noting that "buy-in" is always a challenge in the beginning, LCDR Arnold said that the core team encourages these individuals to come in and observe the development process. They usually become intrigued and discover that CBT can be an effective learning tool. Some tinker with the models and realize that operations personnel can learn to use them. The core team encourages supervisors to write the tests for the modules. CBT will not necessarily replace all traditional training. The CBT courses are aimed at Coast Guard personnel who need to get up to speed before attending regular courses, who cannot attend regular courses, or who want to learn or review to keep current while in the field.

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Infinet Outbreak 2010: A Vision for the Public Health Training Network

Dennis McDowell, Centers for Disease Control and Prevention
Nona Gibbs, Centers for Disease Control and Prevention

Session Overview

This session was designed to provide a vision of how technology will be used in the future to assist public health officials and workers in the control and prevention of disease outbreaks. Nona Gibbs, the deputy director of the Public Health Training Network (PHTN), Centers for Disease Control and Prevention (CDC), first gave a brief description of the PHTN, including background, organizational structure, and mission. Dennis McDowell, director of the Public Health Training Network, then demonstrated a computer simulation of how today's communications technologies and approaches to disease control and prevention may evolve in the future to enhance the capabilities of a public health official confronted with an outbreak. The session's underlying theme was that everyone involved in Federal training should have a vision of how to employ technology in the future and should consider **now** where they want to go with the technology.

Background

The PHTN is a distance learning network established in 1993 by CDC and several strategic partners at a time when the CDC needed an alternative medium to reach its training audience. The CDC trains not only Federal health workers, but also the staff of state and local health departments and practitioners involved in disease control and prevention. Traditionally, trainees came to the CDC classroom training facilities in Atlanta, GA. The PHTN headquarters is in the Division of Media and Training Services, which has a mandate to support each of the Centers for Disease Control and Prevention. The PHTN is able to produce and deliver distance learning programs in a variety of media, ranging from print-based self study to satellite videoconferences and Web-based training. The Division attributes part of its success to its partnering efforts with other Federal agencies.

CDC's Vision for the Future

Assumptions about the future of public health. The CDC is in the prevention business. As such, the CDC has a vision for the future of this business, based on four basic assumptions:

- Microorganisms will continue to be a threat.
- Pressure to reduce health care costs will lead to more prevention and applied research.
- Human behavior and demographics will create new public health challenges.
- New technologies will increase opportunities for prevention.

Communications Technology Now and in the Future

Communicating directly to the CDC. Public health workers, and even members of the public, can already communicate directly to CDC at any time, through the CDC World Wide Web site (*cdc.gov*). The CDC Web site contains information about threats to health, disease data, prevention recommendations, reports, travelers information, and more.

Connectivity. The CDC envisions public health workers being able to connect to their colleagues at virtually any location, day or night, to share—

- Data
- Ideas
- Problems
- Solutions
- Networking.

Attendees were told that even today, thousands of public health workers at the state and local levels are already connected across the country and even across continents, through the connectivity supported by programs such as WONDER (Wide-Ranging Online Data for Epidemiological Research) and INPHO (Information Network for Public Health Officials) and various other information networks for public health.

Learning about and enrolling in distance learning programs through the Internet. Soon, through the PHTN Web site (*cdc.gov/phtn*), public health workers will be able to learn what courses are available in their communities or even at their own desktops, and enroll in them through the Internet. In the last four years, more than 500,000 public health workers have taken PHTN distance learning courses through a variety of media. Today, the PHTN reaches more than 250,000 people each year in several key course areas. Distance learning in the future will be based on a new vision of a united network across all prevention agencies at all levels. This network will be seamless, interoperable, and coordinated.

Public Health Image Library. Public health researchers, managers, trainers, educators, public relations staffs, and even the public will have immediate desktop access to important public health images of microorganisms, diseases, symptoms, positive or negative health behaviors, and hazardous environmental and worksite conditions. CDC is already working on this idea and it may not be long before the Public Health Image Library (PHIL) is available. PHIL is an Internet based digital image library of public health photographs that can be previewed and downloaded. These images will consist of both still images and moving images, such as video clips. Through PHIL, public health workers will have immediate access to information that will help them to identify, diagnose, treat, and prevent infectious and chronic diseases.

Even now, as part of PHIL and other efforts, CDC programs are experimenting with converting existing videos to formats that can be delivered via the Internet, and utilizing the Internet to Webcast a variety of distance learning programs.

Support of laboratories. The CDC envisions smart computers supporting laboratory officials, physicians, and technicians in their efforts to sort through thousands of lab test results to find the ones that indicate especially dangerous or drug-resistant microorganisms or abnormal cell growth. Already, efforts are underway to electronically link laboratories, using computer image scanning and pattern recognition software. These specialized programs can search through thousands of electrophoresis and other lab test images to identify the one that matches a specific profile of a disease or contaminant and automatically report the results—not only to the doctor but also to the health department.

Computer based intelligent programs. The CDC envisions artificial intelligence programs that can help epidemiologists detect conditions suitable for an outbreak almost before it begins. Smart computer programs called "Go Bots" (also known as intelligent agents) can search through huge amounts of information and assemble probability pictures to help epidemiologists prevent large-scale outbreaks. These programs will build upon a foundation of computer-based epidemiological information programs and epidemiological map programs to lead the CDC in the direction of virtual epidemiologists.

Prevention programs. Future prevention programs will link computers and televisions to provide interactive real-time patient support systems. These "tele health" systems will be available to the chronically ill whose quality of life can be improved by changes in behavior, diet, exercise, and medicine. The CDC is working with applications of these systems to prevention priorities such as immunizations, diabetes, AIDS, and hypertension. Tele health systems will provide "virtual patient support" to improve patient outcomes and avoid emergency health care. According to Mr. McDowell, this capability and more will be commonly accepted as part of preventive patient care practice by the year 2000.

Simulation of Communications Technology in the Year 2010: "Outbreak Control Year 2010"

Mr. McDowell demonstrated a computer simulation of the virtual office of a public health officer in the year 2010, who is confronted with a disease outbreak taking place in Cobb County, Georgia. In the future, the public health role may be much more vital to the health of the community than ever before. A global health information network will make it possible to serve individual, family, and community prevention needs in a completely new way. Access to the global network would be customized to serve each health official's needs and important functions through a suite of interoperable applications to enhance communications, disease surveillance, epidemiology, and decision making on policy and prevention, and to provide a virtual learning environment to help share prevention knowledge.

The simulation presented a vision of "virtual epidemiologists" capable of monitoring disease trends and outbreaks, anticipating data-gathering needs, surveying doctors and patients, and helping the local, state, and Federal public health officials and other organizations reach decisions for preventive interventions. The simulated outbreak centered on an increase in positive E. coli lab results, detected through automatic searches of reports of positive DNA confirmed lab reports, notifiable diseases, and specified conditions. This "active lab surveillance" would allow a

quick response when epidemics are just beginning. Data could be automatically gathered from doctor's offices and lab reports all over a specified area, and automatically analyzed for known diseases. The "virtual epidemiologist" knows to initiate a search of computerized medical records for the right diagnoses, because the CDC previously helped to standardize the nomenclature coding schemes.

As envisioned in the simulation, the extensive communications infrastructure would allow physicians in private practice, and even members of the community, linked through interactive computers and televisions, to work with public health officials to determine the source of the outbreak. Personalized requests for assistance and participation in surveys would be initiated through interactive televisions; citizens and doctors would complete the interactive surveys in their homes and offices; and survey results would be automatically collected and analyzed by the virtual epidemiologist to identify the source of the outbreak.

Also available on the network would be access to information on past events, current scientific information, and prevention and treatment recommendations related to the diagnosed outbreak.

And, through the global network and interactive technologies, news reports and press releases could be created, customized, and disseminated very quickly.

Conclusions

To achieve the type of proactive, responsive, interactive environment envisioned in the simulation, the CDC must build the communications infrastructure by—

- Investing in research and development
- Establishing the network of collaborations
- Understanding the direction of information economy and technology for public health
- Moving from distance learning to distributed learning and distributed responsibility for learning.

Research and development projects are under development to sort out the technical issues that will result in standards acceptable to the entire community.

The PHTN is already an example of a successful collaboration of many networks and contributors. The PHTN will help to establish the behavior of lifelong learning. The technology has to be in place to support the behavior, or it will happen at random.

And, the CDC has already established the INPHO through a successful partnership of public and private institutions. Through INHPO, the CDC will continue to build and promote connectivity as indispensable to every public health worker.

Areas of emphasis at present are distance learning, electronic surveillance and electronic reporting, and a decision support environment.

Discussion

Standards

One attendee addressed the development of standards among all parties who would be connected in such a global network. Mr. McDowell replied that CDC will use industry standards for the technology, and that there are case definition standards consistently used. But, Mr. McDowell conceded that consensus on direction is a human problem and that the CDC needs a consensus building process. The CDC uses the simulation to help share their vision for the future across other potential and current partners.

Big Brother versus States' Rights

An attendee raised a concern about electronic surveillance of laboratory results and doctor's reports. Mr. McDowell pointed out that some data is already required to be reported by law; sometimes by results, not individual names. There are built in safeguards for confidentiality; Federal health officials have learned hard lessons about the importance of obtaining cooperation from the local and state public health officials involved in assuring a confidential reporting system.

Course Materials on PHTN

An attendee asked if it was possible for other (non-CDC) courses to be made available on PHTN. Mr. McDowell said that part of what PHTN tries to do is act as a clearinghouse of all materials available—no matter who produced them. All courses must serve their constituents to help improve the performance of prevention workers. To provide continuing education units, the requirements for a course on the PHTN are fairly strict. A CDC doctor or nurse has to be on the planning staff of the product or course; there must be learning objectives; and the outcomes must be tested. These requirements mean that course registration is required.

PHTN Course Development

An attendee wanted to know if PHTN courses are developed by internal staff or by external consultants. Ms. Gibbs explained that in the beginning, PHTN courses were developed in-house. Now, especially since they are moving to Web-based courses, courses are developed through teams assembled of both internal staff and external contractors. The teams follow an established quality assurance process to apply internal standards to all course development projects. The process requires that content accuracy, production quality, and return on investment issues are addressed before any project is started. The process also involves rigorous peer review and adherence to quality assurance standards.

The WONDER Database

An attendee asked what the WONDER program is. This is a database that was started as a repository of aggregate data for communities to be able to observe how their community compared to other communities in terms of disease incidence and conditions. To promote this

database, CDC had to address the issue of connectivity. WONDER is available through the Internet to qualified users who have paid a minor fee and obtained an account password. WONDER is updated quarterly.

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Overview of FAA's Interactive Video Teletraining (IVT) Studio and IVT Skills Course

Amelia "Cissy" Lennon, Ph.D., Federal Aviation Administration
Linda Braccini, Federal Aviation Administration
Bob Rescinito, Federal Aviation Administration

Session Overview

The session was opened by Dr. Cissy Lennon, Operations Manager of the FAA's Interactive Video Teletraining Studio. Dr. Lennon explained that the rest of the session would consist of a presentation delivered by interactive video teletraining (IVT) technology that would provide both an overview of this technology and a summary of key guidelines for delivering successful training using IVT technology.

Bob Rescinito and Linda Braccini, Instructional Systems Specialists in the FAA Academy's Training Support Division, then addressed the group via one-way video, two-way audio satellite communication from the FAA's Oklahoma City studio.

Using the Keypad

Twenty-six participants in the session room were provided keypads for use in interacting with the Oklahoma City instructors. Ms. Braccini explained and demonstrated the use of various buttons on the keypad, and then showed on camera what the instructor sees on the console display when these keys are pressed.

The features demonstrated include the following:

- *Call button*. This button is pressed by participants when they wish to ask the instructor a question or make a comment. The instructor display, after a several second delay, displays the names and locations for those students who have pressed this button. By touching an icon on this display, the instructor can address and talk with a student. A green light on the student keypad indicates when the student is being called on.
- *Flag key*. This key is used by participants to respond to "polling" questions from the instructor, much like a show of hands. Responses are anonymous, however. When this key is used, the instructor display indicates what percent of the audience pressed the button in response to the question.
- *Viewer window and response buttons*. When a multiple-choice question is posed to the audience, the viewer window displays letters corresponding to the responses above a row of response buttons. When a true-false question is posed, the viewer window labels the response buttons as True and False. Students use the response buttons to select their answers to questions (in the demonstration, the questions and possible responses were shown on the broadcast screen). Immediately the instructor

display indicates the percent of participants who have answered, and a histogram is plotted that shows the percent who have selected each response. Once the instructor chooses to judge the answer, the histogram can be broadcast to the students as well.

- *Number keys*. In response to numerical questions, participants type in the number and press the Enter key on their keypads. The instructor display, which can also be broadcast after the answers are judged, indicates the percent of participants who have answered, along with the minimum value, maximum value, average value, and total of values entered.

FAA Distance Learning Program

IVT is just one component of the FAA's distance learning program, Mr. Rescinito indicated. Correspondence study, the original distance learning "technology," continues to be used at the FAA; the FAA has an extensive program of computer-based instruction (addressed in several other presentations at the Symposium), and some courses use combinations of these distance learning methods.

FAA IVT Capability

Courses delivered. To date the FAA has presented 51 IVT courses, ranging from 2.5 hours to 46 hours in length. Classes have been composed of from a dozen to nearly 600 participants. Over 500 training hours have been presented to more than 3,600 FAA employees. The FAA studio is also used by other government agencies including the Internal Revenue Service and the U.S. Department of Fish and Wildlife.

System operation. The one-way video/two-way audio system uses a compressed digital video signal with the viewer response system demonstrated in this session. The FAA has more than 30 receive sites in locations across the country. Costs for the system are contained by the design, which provides extensive capabilities at the instructors' fingertips and which requires only one production support staff member to be present with the instructors.

Production equipment. Kevin Lowe, Studio Director, pointed out the equipment in the control room. This included a program monitor, two video toasters used to superimpose captions on the video image, and touch screens used to manage and select input and to display the same information that is shown on the instructor's screen. Mr. Lowe demonstrated the use of this equipment to bring in still images and videotaped input. Other equipment in the control room includes videotape machines and computers that are used to broadcast video, and machines that convert slides to video signals.

Other instructor features. Mr. Rescinito then identified other features that are provided for instructors to use. In addition to the touch screen response display on the instructor console, which was described and shown earlier, he identified the following equipment:

- A second screen in the instructor console allows the instructor to control other equipment in the studio such as a videotape player.

- An overhead camera and a preview screen focus on a surface on which special items can be placed for broadcast to the viewer (the sample keypad was displayed from this station).
- The instructor can use **chroma key** to write or draw on the surface under the overhead camera, producing handwritten information that is superimposed on the video image. This is similar to the feature used by weather reporters to mark up weather maps and by sportscasters to diagram football plays.
- In front of the instructor console are the camera, hidden behind a mirror, and program monitor, so the instructor can see what is being sent to the students. The control room is visible to the instructor through a glass wall.

Mr. Rescinito and Ms. Braccini emphasized that all the equipment is easy to use and easy to learn to use.

Delivering IVT Instruction

Delivery guidelines. Ms. Braccini then illustrated and described some important guidelines for instructors delivering IVT instruction. These guidelines, which were taken from the FAA IVT Skills Course that prepares instructors to develop and deliver broadcast training, include the following:

- Maintain proper posture and eye contact.
- Find ways to build rapport and to ensure that students feel they are being heard.
- Wear appropriate clothing. Be aware of what colors and patterns look good on camera and against screen backgrounds.
- Use props as appropriate to the content, similar to those that would be used in a classroom course.
- Avoid distracting jewelry. Do not wear too many rings or bracelets, and avoid dangling earrings.
- Do not tap on the console surface.

Involvement strategies. Anything that works in the classroom will work in IVT to get students involved, Mr. Rescinito and Ms. Braccini indicated. Techniques that can be used include brainstorming, use of case studies, demonstrations, team teaching (both in the studio and with instructors at remote sites), and role playing. In addition, it is always recommended to have fun, and use humor and special video effects to loosen up and involve participants.

About the IVT Skills Course. The FAA IVT Skills Course is a five-day course that prepares instructors to develop and deliver broadcast training. The course is taught by televideo, so participants can see proper methods modeled as they learn about the equipment and approaches. A mock studio is maintained and used to allow the participants hands-on practice with the equipment and techniques. Further information about the course can be obtained by calling the AMA-300 Training Support Division at 405-954-9300, or the IVT Broadcast Studio at 405-954-9302.

Discussion

Questions were taken by call-in from participants, further demonstrating the IVT capability.

Brainstorming Techniques

One participant questioned how effectively brainstorming activities could be performed, given the fact that there is a several second delay in the transmittal of information. Ms. Braccini indicated that one solution is to have two microphones open at once. Another technique is to pose a question, have students at each site first discuss it among themselves, and then share the information with instructors at the conclusion of the process. Faxing and E-mail are other ways to facilitate communication and responses.

Costs

A question about the costs of setting up a studio and the charges for studio use and satellite time were referred to Hank Payne of the FAA, who answered the question at the conclusion of the broadcast. Mr. Payne indicated that studio use and satellite time costs are about $300 per hour. He indicated that the FAA has provided uplinks for other agencies' studios at approximately $110 per hour for satellite time alone. An estimated investment of $625,000 was identified for hardware and equipment costs.

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Overview of Satellite-Based Federal Government Distance Learning Initiatives

Hank Payne, Federal Aviation Administration
Jolly Holden, Ph.D., GE Capital SpaceNet

Session Overview

Mr. Payne began his overview by identifying many Federal agencies that have analog and digital networks.

Federal Nonmilitary Networks

Federal **analog** networks include the following:

- Veterans Hospital Administration (VA)
- Centers for Disease Control and Prevention
- Health Care Financing Agency (HHS)
- U.S. Customs Service (Treasury)
- Housing and Urban Development (HUD)
- Federal Law Enforcement Training Center (Treasury)
- U.S. Department of Agriculture
- U.S. Department of Justice
- FBI.

Federal **digital** networks include the following:

- U.S. Department of Energy - *E-Train*
- Federal Aviation Administration - *Aviation Training Network*
- Social Security Administration - *Interactive Distance Learning Network*
- Veterans Benefits Administration (VBA) - *Interactive Distance Learning Network*
- U.S. Postal Service - *Postal Service Training Network*
- Internal Revenue Service
- Environmental Protection Agency
- U.S. Coast Guard
- Housing Telecommunications Inc. (HUD funded)
- Federal Courts (in progress)
- Fish & Wildlife Service (in progress)
- Other (GSA, NRC).

Military Networks

Military **digital** networks include—

- U.S. Army Training Support Center - *Satellite Education Network*

- U.S. Army TRADOC - *Teletraining Network (TNET)*
- U.S. Air Force - *Air Technology Network*
  - Air Force Institute of Technology
  - Air University
  - Air Education and Training Command
  - Air Force Reserves (AFRES)
- Air National Guard - *Warrior Network*
- NAVAIR
- Defense Information Systems Agency (DISA)
- Defense Equal Opportunity Management Institute (DEOMI)
- Defense Logistics Agency (DLA - in progress).

Mixed distance learning networks in the military include—

- Army National Guard - Hybrid (analog and digital)
- Marine Corps - *Satellite Education Network (SEN)* (terrestrial based digital)
- U.S. Navy - *CENET Electronic Schoolhouse Network (CESN)* (terrestrial based digital)
- U.S. Army - *Teletraining Network (TNET)* (terrestrial based digital).

In response to a question, Mr. Payne explained that transmitting digitized signals was less costly than transmitting analog signals.

Government Education & Training Network (GETN) Sites and Capabilities

The Government Education & Training Network (GETN) provides opportunities for cooperation. Through this network, gateways can be provided from analog to digital signals and vice versa when uplink and downlink modes do not match. A total of 940 downlink sites are part of this network now, with expansion to more than 1500 underway. Most agencies who own uplinks are willing to provide other agencies studio time or access to uplinks via terrestrial lines.

The following Federal government organizations have the indicated number of downlink sites within the GETN:

- DOE - 21
- SSA - 221
- EPA - 110
- VBA - 63
- IRS - 83 (expanding to 250)
- FAA - 31
- U.S. Courts - 200 (in progress)
- U.S. Fish & Wildlife (in progress)
- Other - 8.

The following military organizations have the indicated uplink capabilities:

- Air Force - 4 uplinks with 24 channel capability (7 installed)

- Army - 2 channel capability (2 installed)
- Air National Guard - 3 uplinks with 14 channel capability (6 installed)
- Defense Equal Opportunity Management Institute (DEOMI) - 1 channel capability (1 installed)
- Army National Guard - T-1 terrestrial connectivity to Air National Guard
- DLA - 4 ISDN connections to 2 uplinks.

The following Federal government organizations have the indicated uplink capabilities:

- FAA - 6 channel capability (4 installed)
- DOE - 1 channel capability (1 installed)
- SSA - 6 channel capability (4 installed)
- VBA - T-1 terrestrial connectivity to FAA
- IRS - 2 channel capability (2 installed)
- Coast Guard - ISDN terrestrial connectivity to DEOMI
- Federal Courts - Analog connection of ANG uplink
- U.S. Fish & Wildlife - 1 channel capability (1 installed).

GETN Initiatives

In addition to providing access to the delivery technology, organizations in the GETN are supporting a number of initiatives to support use of the technology. Sharing of courses has lagged behind the sharing of hardware, but some efforts are underway in this area as well.

The FAA is sharing a site with the National Technological University to support an effort to broadcast engineering courses to employees requiring continuing education in technical areas, as well as to those wishing to earn advanced engineering degrees. A National Research Consortium for Satellite Delivered Education and Training has been formed to broadcast accredited courses to enable employees to earn degrees by distance learning.

The Army National Guard has established a Web site that can be used to identify downlinks available at any given time, and that identifies POCs to call to find out charges and other details. A planned initiative within the GETN is to create an on-line programming listing for the entire Federal broadcast training community, indicating all courses being offered, and identifying (using a color code) those courses that are open to employees from agencies other than the originating agency.

The GETN has provided the Web server for the Government Alliance for Training and Education (GATE), an organization of Federal government employees (vendors are excluded) founded to avoid unnecessary duplication and promote sharing of resources across agencies. GATE membership is free of charge. The professional organization associated with GATE is the Federal Government Distance Learning Association (FGDLA), which includes the entire Federal government distance learning community, including vendors. The Web site for FGDLA is *http://www.fgdla.org*.

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Overview of DOE Teletraining

Don Cook, Department of Energy
Charlie Brown, Wackenhut Services Incorporated
Robbie Smith, Department of Energy

Session Overview

Robbie Smith, distance learning specialist from the Department of Energy (DOE) and member of the Symposium planning team, began this presentation by explaining that preliminary efforts had been made to forge partnerships between the Albuquerque public school system and the Department of Energy Safeguards and Security Central Training Academy (CTA) at Kirkland Air Force Base. These preliminary partnership investigations have focused on shared concerns about employee development and on the possibilities of DOE helping to provide distance learning for the school system.

The remainder of this presentation was a live interactive television (ITV) broadcast with one-way video and two-way audio between DOE Academy staff and Albuquerque area educators, located at the Academy ITV studio, and the viewers attending the Symposium session. The broadcast/ two-way discussion served several purposes: it served as a demonstration of many of the capabilities of ITV, building on previous presentations in this session by the FAA; it provided an overview of distance learning at the Central Training Academy; it provided an overview of preliminary efforts to build partnerships between DOE and public schools in New Mexico; and it provided an opportunity for discussion between Albuquerque area educators and the Symposium viewers on a variety of topics ranging from professional development to the introduction of technology into the education curriculum and the education process.

ITV and Distance Learning at the DOE Safeguards and Security Central Training Academy

Don Cook, Director of the Central Training Academy, explained that five years ago, his organization undertook a challenge to develop a world-class, high-technology, learning center of excellence. In this process, Academy staff consulted experts in academia, in Fortune 500 corporations, and in other government agencies. At the time, more than 150 courses for DOE employees were taught at the Academy in traditional classroom settings, at the same time that DOE resources and numbers of employees were shrinking. One of the goals was to find an economical way to reach students across great distances. It was clear that the Academy needed to embrace technology in order to remain a viable and effective organization.

In responding to this challenge, the Academy has embraced two important technology-based strategies: the first was to convert a significant component of the courses to multimedia delivery, so that students could take the courses at their work sites; the second was to develop a significant ITV capability so that instructors could deliver courses to staff across the country. More than half of the courses have transitioned to multimedia delivery. Further, in order to ensure the

continuing value of their courses to the staff, a large number of courses were redesigned so they would receive American Council of Education (ACE) accreditation, allowing employees to receive college credit for course completion.

ITV capabilities. In contrast with the approach taken at the FAA, DOE made the choice to develop a full-scale broadcast quality television studio. With a commitment to leveraging technology to create "entertrainment," significant production support for instructors is provided. The studio is supported by a full operations crew including an audio specialist, a technical director, a director, a graphics specialist, a One-Touch (keypad interaction) specialist, and a floor director. A separate, more compact, instructor-operated studio (similar to that shown earlier in this session by the FAA) was created as well. Courses are currently delivered to some 25 downlink sites across the country.

Partnering with the Public Schools

In ongoing efforts, the Academy has been exploring opportunities to use its capabilities to support public schools in New Mexico. In a videotape segment shown in the broadcast, Senator Jeff Bingamon visited the Academy ITV studio and expressed his enthusiasm about the potential for use of distance learning capabilities such as ITV to ensure that rural high schools across New Mexico could offer a full curriculum, including Advanced Placement (AP) courses, to meet all of their students' needs. There is an ongoing partnership between the Academy and the Albuquerque Public Schools exploring opportunities for using distance learning to provide professional development, as well as exploring opportunities to insert technology into instruction, as appropriate. The organizations are working together with the hope of obtaining grants to support pioneering efforts.

Discussion Between Albuquerque Educators and Session Viewers

Prompted by some multiple choice questions presented to the viewers, and questions asked by Mr. Cook, by Charlie Brown (a CTA instructor), by Albuquerque area educators, and by some of the viewers, the ITV capabilities were used to report answers and to facilitate discussion on a variety of topics relating to professional development and technology in education.

Importance of career development for educators. Viewers were polled on this question and were asked to use their keypads to enter their responses. Nearly all of those responding indicated that career development was very important. When asked to explain the reasons, the Albuquerque area educators indicated that professional development is important for staff at all levels, from administrators, to teachers, to paraprofessionals. Some staff rely on the school system for basic professional training; all need ongoing professional development to keep up with changes in the world and in education (especially technology) and to be able to make connections between educational experiences and the real world.

Comfort with technology in the classroom. When polled on this question, more than half of viewers were very comfortable, and nearly half were somewhat comfortable, while one viewer was undecided. (This result was displayed on the broadcast screen using the One Touch keypad

technology.) The Albuquerque educators indicated that within the system there was a much more mixed set of attitudes, with many staff who have not yet developed comfort with technology.

Use of technology in Albuquerque area schools. One private school in Albuquerque has recognized that students must be comfortable and capable with technology if they are to be prepared for the future work world, and has begun to integrate technology into the curriculum. Within the public schools, all schools have recognized the need to integrate technology into the classroom as a priority; all schools have their own technology plans, and are at a variety of stages in implementation. One educator noted the importance of fully developed logistical plans for implementing technology within a system. Another indicated the value of having a computer lab, where students could learn computer skills, and then computers in the classroom, where students could use computers as tools for performing their academic tasks. In addition to realizing that technology-based skills and the use of technology need to be incorporated into the curriculum, educators acknowledge that technology also offers new ways of delivering education.

Role of technology in professional development. In response to a question from a viewer (in Washington), Albuquerque educators indicated that, as in the educational curriculum, training on the use of technology is an important part of professional development; those who know how to use software tools, for example, provide training to those who do not. Technology is also viewed as a potential tool for delivering staff training. Albuquerque educators acknowledged that distance learning would be a very useful way to reach system educators, many of whom are located at moderate distances in somewhat remote locations.

A viewer from the Department of Labor indicated that, in this agency, video conferencing is being used for a variety of purposes; it is being used for job interviews, to deliver career counseling, and to coach supervisors on how to coach their staff. Mr. Cook indicated that DOE staff have participated in efforts in which employees from more than 30 agencies at 100 downlink locations have accessed satellite-based information of importance across agencies.

Service models for professional development. Albuquerque educators indicated that there is a bottom-up approach to professional development, with training requests originating with parents, educators, and schools; the training is provided on request by the school system. These educators then asked about the models in use in the school systems and organizations represented by the viewers. One viewer indicated that in one Maryland jurisdiction, training consisted of state-approved workshops taught by other educators; these courses are listed in a catalog and are available at local request. The viewer from the Department of Labor described the value of partnering with local colleges in providing access to professional development courses.

Conclusion

In concluding the broadcast, Mr. Cook reiterated that he strongly favors partnerships of many kinds in order to assist in the proliferation of technology in education.

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Preparing for the Future of Learning Technology

Judith A. Goldman, Naval School of Health Sciences
Raye Newmen, Ph.D., Consultant

Session Overview

This session gave a comprehensive overview of the philosophy and technology currently being used by the Naval School of Health Sciences' (NSHS) Audiovisual Interactive Medical Multimedia (AIMM) Department, which is directed by Judith A. Goldman. The primary focus was on the development of the first DVD-ROM interactive multimedia training course. The co-presenter, Dr. Raye Newmen, spoke primarily about the technology and the *AIMM for the Future* project. An integral part of Ms. Goldman's presentation was the demonstration of the DVD-ROM course, *Management of Chemical Warfare Injuries*.

The Philosophy

Background. Hospital corpsmen have to be "readiness trained" to do their job in a realistic medical operational environment. Many times these medical environments are unique, different, and potentially catastrophic. Because of the standards and restrictions set by professional medical associations in this country, corpsmen are not permitted to diagnose and treat patients. The only field experience corpsmen might expect to receive would be acting as backup medical support on a military base or in a first responder situation. Yet, once trained, these corpsmen are expected to be field-ready. Once deployed to a Marine outfit or to a ship, the corpsman is the doctor. If the nation goes to war, corpsmen at 18 or 19 years of age could be expected to walk into a mass casualty situation and perform satisfactorily. Since mass casualties are uncommon in this country, corpsmen are poorly experienced and often ill-equipped psychologically to take charge of a disaster area and endure through the crisis. If they manage, they are a testimonial to their own personal character, and reflect well on the training they have had.

Simulations as a primary learning tool. Corpsmen need the opportunity to experience the situation before they are in the battlefield or deployment arena. This experience can be provided through simulations that include decision making and situational tradeoffs that produce mental experience. Ms. Goldman used a personal educational slogan to emphasize this point: "Good judgment comes from experience. Experience comes from bad judgment." If corpsmen never have the opportunity to make a mistake, or to take a risk, or to figure out what works and what doesn't work, what's appropriate for them and what they can manage as human beings, then their successful performance during a crisis becomes more unpredictable than predictable. Many people don't know how they will hold up under stress.

Simulations can provide the experiences needed before a corpsman has to face a crisis for the "first" time on the battlefield. For corpsmen to perform well, they have to know the right procedures to use and when, and they have to know them automatically. There is no time to practice when the real thing occurs. Since most decisions we, as human beings, make are based

on incomplete knowledge, we are often unsure of the decisions we have made unless we receive positive reinforcing feedback. Once the corpsman experiences two or three successes, data points or check points are created to guide future choices.

The Solution

Decision to use DVD-ROM. A decision was made to convert *Management of Chemical Warfare Injuries* to DVD-ROM because the CD-ROM version is the only multimedia training tool of its kind on the topic, and the topic is eminently pertinent to the Department of Defense. The resulting production depicts five waves of casualties, with four patients that have to be correctly triaged in each wave. This project was previously developed on laserdisc and later converted to CD-ROM. However, CD-ROM did not provide high-impact resolution, motion synchronization, or full screen video, and did not enable students to ideally see the "signs and symptoms" that are pertinent in treating patients. Some of the advantages of DVD-ROM include size (same size as a CD-ROM), increased compression capability (allowing the inclusion of high-resolution, real-time video), and portability (avoidance of proprietary systems by using off-the-shelf systems). A DVD can be used on a laptop, which provides the opportunity to complete training during non-prime time hours, at home or in the evening. It provides on-demand, "just-in-time" training.

Demonstration. At this point in the presentation, the audience had an opportunity to see how the DVD product worked. The quality of the video was excellent. The presenter explained that the video had been reconfigured for a resolution of 1024 x 768. The original program design split the screen so the video actually filled about 720 x 480 for the chemical warfare scenario, while a picture of the patient filled the upper left portion of the screen, and choices and selection buttons were displayed on the bottom of the screen. The demonstrator explained that DVD-ROM files are definitely larger that CD-ROM files. The demonstration program was about 2.5 gigabytes. Visual Basic was used to develop the product because it is a lot more flexible than Authorware (which was at version 6.0 when the project was started), or other authoring products. Eventually, Ms. Goldman plans to use the Internet for distribution, but at this time there is too much run-time video to make this realistic. One possibility within reach would be a hybrid solution, using a DVD-ROM drive on a LAN and putting the text program on the Web, thereby making it easy to change feedback and text.

The DVD-ROM product has three major sections:

- *Tutorials.* Instruction on different chemical agents and the physiological signs and symptoms caused by exposure to them, along with appropriate treatment an decontamination procedures.
- *Scenarios.* Triage exercises with five waves of causalities with four patients in each wave, where the student needs to synthesize the knowledge learned to make accurate decisions and weigh the tradeoffs in prioritizing and treating patients.
- *Reference.* Background information to assist and enhance learning modules.

The student has four choices with each patient: (1) examine the patient, (2) treat the patient, (3) decontaminate the patient, or (4) give a disposition for the patient. At the end of the lesson

there is an evaluation. The student receives feedback on his decisions and the reasons his decisions were correct or incorrect. A panel of experts in triage was used to assist in compiling these scenarios and their feedback.

The Technology

Distributed system architecture. At this point in the presentation, Dr. Newmen spoke about the technology being used and the technology to come. The vision is to create a training architecture and infrastructure, development tools, and content that can take advantage of new technology as it develops in the future. Distributed system architecture will allow people to access training wherever they are. Components or objects will eventually be distributed over the whole Internet, without duplication. What is needed is an "open architecture" to provide the opportunity to increase productivity and reusability and to greatly increase access to content. This process may be fairly gradual over the next five years. The content will be driven largely by the training requirements.

Synthetic training environments. The ideal environment is one that is currently being used by the gaming industry, where a person becomes totally immersed in the situation, similar to 3-D technology. There is no point in using stick figures when you are trying to train a medical corpsman in the treatment of chemical warfare patients. Video is costly and is not "flexible" enough. The tremendous advantages of 3-D synthetic worlds are responsiveness, interactivity, and flexibility. Every time a user enters one of these environments it is a fresh experience, and anything can occur unexpectedly. A future implementation of this concept might be the use of "data gloves with haptic feedback," where the corpsman actually sees his hands in the scenario and can "feel" a pulse. The goal ultimately is to eliminate the computer, in the sense that it is an intermediary between the learner and the experience. The gloves would provide a "direct manipulation interface," and the computer would respond through voice input/output. These synthetic environments would provide the best way to train people by putting them in the environment and letting them do the job, learn from that job, learn from their successes and failures, and get the correct feedback to do better the next time. A virtual mentor can be added to the scenario to help the person get unstuck and move on to the next situation. Another modality might also be to use this approach in testing and certification.

Development plans. Currently AIMM is in Phase I for fiscal year 1998. Phase I consists of the requirements analysis. An architectural model is being developed with an "open architecture" and adherence to accepted industry and international standards. Phase II will occur in fiscal years 1999 and 2000, when tools will actually be developed. High-resolution video will still play a key role, along with photo-realistic 3-D environments, because they provide such a wonderful way to show processes and procedures.

Conclusion

If this technology and approach are to be used, it is very important to first have a plan or a vision of what is to be trained and the ultimate desired outcome. "If you don't know where you are

going, any road will take you there." The technology is the tool that executes the vision and the plan.

Discussion

AIMM for the Future Project

The DVD-ROM is a prototype project to explore using the technology as a distribution medium for training, as opposed to CD-ROM, in order to provide a better level of visual quality so that patient signs and symptoms can be perceived by the student, not "spoon fed" to the student. The *AIMM for the Future* project (Phase II) will ideally leap frog into full implementation in the coming years.

By creating the simulation, the users will be able to evaluate themselves. The hope is that it will not be an evaluation tool in the "strict" sense, but will help improve the performance of the participant.

Ethical Implications

Ethical considerations and responsibility for decisions are involved when assigning people to field jobs. The ideal is to get beyond filling billets with warm bodies, particularly when the demands of the job and the consequences of a corpsman's performance are as profound as life and death situations. A possible outcome of this technology might be a sort of "early self-selection process," by which people can recognize if they are not fit for this job and can have a gracious way to back out and make a career change that does not bring punitive implications. The job of a medical corpsman is not for everybody. However, utilizing synthetic training environments and immersing the student in the scenario can be an incredibly powerful training technique. This strategy might not work for everyone, but for the individuals that it does help, this strategy will produce a higher level of competency and confidence overall.

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Training and Evaluation Support System (TESS)

Mary E. Sand, Federal Aviation Administration
John D. Ogden, Federal Aviation Administration

Session Overview

This session presented and demonstrated the features of the Federal Aviation Administration (FAA) Training and Evaluation Support System (TESS), an innovative, user-friendly, embedded performance support system that integrates training topics, examples, job performance, tools, and templates. Mary Sand presented the first part of the presentation and John Ogden conducted the demonstration.

Background

Overview. The FAA developed TESS to maximize cost effective job-related training. TESS uses instructional systems design (ISD) principles for systematic analysis, design, development, implementation, and evaluation of training programs. It enables managers to make critical training media decisions. It is an electronic performance support system (EPSS) that enables managers to optimize training effectiveness on a quantifiable basis. It also provides step-by-step guidance, examples, flowcharts, and expert advice.

What it does. TESS results in the delivery of high quality training in less time, and gives guidance along the way. It assures that the required steps are built into training for effective results, and assures that evaluation is integrated into training at the beginning. An evaluation plan should be built into the training plan, and TESS helps to do this in addition to a pre-evaluation. The training evaluation is based on Kirkpatrick's four levels. One of the advantages of TESS is linking organizational requirements to training design, development, delivery, and evaluation.

As a trainer's tool, TESS provides a comprehensive collection of training and evaluation tools, methods, and approaches. It gives guidance via coaches for each phase of training and evaluation. It provides an easy-to-use process for analyzing strategic plans for training issues, communication, and information sharing.

Four Phases of TESS

Phase I: Organizational needs analysis. TESS guides the user through the gathering of organizational mission, vision, and goals. It uses simple forms with examples and coaches, if needed. It queries on the organizational support requirements, what the potential impact might be, and the benefits that can be achieved, such as to save time and to provide quality, cost-effective training.

Phase II: Training needs analysis. Some of the considerations for the needs analysis include who is the target population; what is the job/task analysis; what performance and success

indicators will be used; does a training project plan exist; what are the learning objectives to be accomplished; what alternate training plans exist; and what will the learners be able to do when the training is complete.

Phase III: Training evaluation plan. There are five steps in the evaluation plan:

1. Initiating an evaluation plan
2. Designing instruments
3. Implementing the evaluation
4. Analyzing the data
5. Reporting results.

Phase IV: Cost/benefit analysis. This fourth phase assists the trainer in comparing the cost of developing training using various methodologies: classroom, computer based instruction (CBI) and multimedia, interactive video teletraining, video training, correspondence study, audio training, and training aids with directed readings. The CBI aids have been very effective with training. The cost benefit analysis is very important, because it is important to know how much training will cost and why a particular medium has been selected for training delivery.

Demonstration of TESS

At this point in the presentation, John Ogden demonstrated TESS. The system is very user friendly and guides the user through menu-driven screens. The system is linear, but allows the user to jump around to different sections. There are similar questions in the organizational and needs assessment sections. There is no "fail safe" response check. Errors can occur in the cost/benefit analysis section if the user does not progress from start to finish, since the cost/benefit section depends on input from the previous sections to develop an accurate cost/benefit analysis.

TESS addresses levels 1, 2, 3, and 4 of the Kirkpatrick model, as well as partnering with the customer. From the Main Menu, the user can hyperlink/hotlink to other sections. It is designed to be used by a novice or an expert. A site map gives a very good overview of the elements of the system. One of the most valuable charts is the flow chart. As the user looks at the questions in the different areas, the user can jump to that area then "cut and paste" sections and put them into his own procedures. At the end of the Organizational Needs Assessment, the user has to respond to a yes or no question to determine if a non-training intervention might be feasible. It is important to remember that TESS is not a design tool; it is a model. The coach feature, which looks very similar to an Internet screen, can be accessed throughout TESS.

The TESS system is very comprehensive. As the user goes through TESS, he can view forms online and then download to a specific project worksheet. Each section of the system has a reporting capability; e.g., in the cost/benefit analysis area, calculations can be built in for salaries.

The FAA is using the TESS product to maximize cost-effective job-related training using ISD principles. This product is helping to standardize and enable managers to make critical training media decisions.

Conclusion

FAA managers are excited about using TESS as a tool for developing a training plan. It is not a "design" tool, it is a place to start.

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Effective Use of Multimedia Training

Wade H. Grimm, Department of the Air Force
Dennis J. Foth, Department of the Air Force

Session Overview

This session began with a clip from the latest Air Force CD-ROM multimedia training course developed for firefighting and emergency services personnel. The course simulates an emergency landing of a civilian 747 aircraft at an Air Force base and challenges trainees to "handle the emergency." Users can experience the event from three perspectives, that of the captain, the lead flight attendant, or the chief of the fire crew. Having gained everyone's attention, Mr. Grimm stated that the main purpose of the multimedia courses produced by the Aeronautical Systems Center (ASC) is to improve the quality of life for Air Force firefighters and other military/civilian personnel who face emergency fire and rescue situations.

Rationale for CD-ROM Multimedia Courses

A ground emergency occurs every seven days, and firefighting personnel must be prepared to react quickly and correctly. When an aircraft makes an emergency landing and a fire is involved, it takes only 90 seconds for the fire to burn through the skin of the plane. Thus, emergency response training is critical where lives and property are at risk. Mr. Grimm explained that because of concerns about water and air pollution, the U.S. Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration had closed many of the live-fire training sites that the Air Force used for practice. Because live-fire training can take place only at a limited number of EPA-approved sites around the country, the Air Force has chosen multimedia CD-ROM training to supplement live-fire training.

Benefits of CD-ROM Multimedia Training

The benefits of multimedia training include the following:

- Individualized access any time of the day
- Consistent delivery
- A controlled learning pace (self-pacing by the user)
- Immediate feedback
- Repeatability of lessons
- On-demand training for all types of aircraft
- Graded performance evaluations leading to eventual certification in, for example, hazardous materials (HAZMAT) emergency procedures
- Automatic record keeping
- Increased retention
- Reduced exposure to hazards.

Mr. Grimm noted that after reviewing 30 studies related to multimedia training, the Institute for Defense Analyses submitted a report to Congress in 1989 stating that user retention of material was 25 percent better with interactive multimedia training than with traditional courses.

For the Air Force, multimedia courses are a cost-effective way to help meet training needs because the CD-ROMs can be used for on-site training anywhere in the world, 24 hours a day. This reduces the instructors' and trainees' need to travel. If a trainee achieves 80 percent accuracy on the multimedia exercises before entering a traditional course, the Air Force has found that the traditional course takes less time. Thus, resources are not wasted. Instructor time is reduced as is the time needed to "get everyone up to speed" at the beginning of a traditional course. Using multimedia CD-ROMs for training also minimizes the new recruits' exposure to hazards when studying, for example, explosive ordnance disposal. In summary, experience has shown that multimedia courses keep training costs down, use man hours effectively, facilitate the transfer of knowledge, and improve retention of the technical content. The cost of the Air Force CD-ROM courses is estimated to be between $1.25 and $4.00 per student instructional hour.

Success Stories

After presenting quotes from satisfied users around the world, Mr. Grimm mentioned the new CD-ROM HAZMAT awareness certificate training as a successful case in point. It was developed at Dobbins Air Base in Georgia for military and civilian personnel to meet national standards set by EPA and National Fire Protection Association (NFPA). This multimedia training replaced courses that took anywhere from 6 to 24 hours depending on the instructor. The interactive course tracks how much time the trainee spends on the lessons and how well the trainee performs; with that data, the original course trainer prepares an evaluation of each trainee. Mr. Grimm noted that after several trainees from Turkey failed the HAZMAT awareness residential course in Italy, they returned home, worked through the CD-ROM course, and succeeded in scoring 90 percent or better on the multimedia tests.

Mr. Grimm then recounted two real emergencies to underscore the usefulness of multimedia courses. Civilian aircraft must sometimes make emergency landings at military bases. If emergency personnel are not intimately familiar with the incoming aircraft, they can study the appropriate CD-ROM course to prepare for the landing. Attendees saw a newspaper account of a Delta flight bound from Cincinnati to London that had to make an emergency landing in the midst of a tornado warning at Wright-Patterson Air Force Base near Dayton, Ohio. Fortunately, the DC-10 CD-ROM course was available for the Air Force emergency personnel to study, and the landing occurred without major incident.

The reverse situation also occurs. In June 1994, a wing malfunction forced a B1 bomber to make an emergency landing at Frankfurt International Airport, the only airport with a runway long enough for a high-speed landing. The local firefighters had two hours to review the CD-ROM course on the B1 bomber—a plane they were not familiar with—before swinging into action as it landed at 278 knots instead of the usual 150 knots and the brakes/wheels caught fire. The knowledge gained from reviewing the multimedia course increased the confidence of the firefighters and the crew and saved a $288 million aircraft.

Hardware and Software

The ASC multimedia training courses require a PC with a 133 MHz Pentium processor, Windows 95, a sound system card, a 6x CD-ROM drive, and a printer. Designed with Authorware 3.5, these interactive courses include video footage, still photos, graphics, animations, audio, and text. Actors are hired for the video footage because they usually do not require repeated "takes" to get the monologue/dialogue correct. Mr. Foth said that the CD-ROM lessons follow the best commercial standards as set by the International Multimedia Association headquartered in Annapolis, Maryland.

Eleven multimedia CDs are currently available from ASC, varying in length from 4 to 24 hours of instruction. Seventeen more courses are in development. Although the Air Force usually cuts 1,500 copies of each CD, its customer base is only 1,100. No classified information is included in these multimedia courses; therefore, the extra copies of the CDs are available free to any Federal agency with similar training needs.

Demonstrations of Multimedia Courses

767 course. Although the Boeing 767 is a commercial airliner, the target audience for the new multimedia 767 course is both civilian and military; this aircraft is used as a military hospital transport plane. From multiple options on the first screen, Mr. Foth (as the trainee) chose "hazards." Audio directions are given by both male and female voices. Real background airport noise is audible as the view (camera) in the video window approaches the 767. Mr. Foth explained that emergency personnel must take care when approaching a plane with its engines running, and that background noise can mask a single plane's engines. On the 767, a beacon light at the front of the aircraft indicates visually that the engines are operating.

Returning to the main menu, the trainee can chose "self-guided tour," which allows a 360° view of the plane, using panorama quick time. Mr. Foth explained that panorama virtual reality can be used to view any confined-space hazardous situation, such as a boiler room, or for 360° hangar views. The trainee can zoom in on a photo of the exterior of the 767 (located on the left side of the screen) or click an area on a graphic (on the right side of the screen) to view a particular section of the plane. Using the mouse, the user climbs the stairs, enters the plane, and again has a panoramic view of the different interior sections. Among other options, the trainee can search for switches that turn off engines or compartments that hold safety equipment.

Another menu contains typical emergency scenarios, such as search and rescue, that were devised by experienced firefighters (subject matter experts). The incident chosen by Mr. Foth has the trainee firefighter searching the 767 for any passengers still on board after a galley fire is extinguished. This is a timed exercise because if the trainee dithers, the stranded passenger will die from smoke inhalation (as would happen in a real emergency). The software randomly generates the location of the missing passenger, and the trainee uses the mouse and zoom features of the multimedia program to make a quick but thorough search through the smoky interior of the

767 to locate the person. This search and rescue scenario took Mr. Foth 1 minute 15 seconds. The program allows trainees to save their score(s) from these practice scenarios.

Mr. Grimm noted that the 747 multimedia course prepared by an OPM-approved contractor provides 8 hours of instruction for 10,000 firefighters at a total cost of $80,000. He characterized this outlay as "pretty cheap."

C17 course. The multimedia course for the C17 was completed 5 years ago; therefore, it is not as technically sophisticated as the 767 course. Mr. Foth demonstrated a scenario that tested the trainee's speed at shutting down the aircraft's oxygen system because of a fire in the cargo bay. Using the mouse and zoom features, the user must locate and turn off three oxygen supply handles inside the plane. The trainee hears audio feedback on the choices made, and buttons allow the user to repeat/review portions of the course using a partial screen.

Mr. Grimm noted that test questions and answers are randomly generated to make sharing answers (cheating) among students more difficult. In the left portion of the screen, the program tracks the users by name, date, elapsed time, and score(s). Trainees are expected to print a record of their work and leave it on the supervisor's desk.

Explosive ordnance course. Among other features, this multimedia course uses quick time virtual reality, which allows the trainee to rotate an object, highlight a portion of it with an arrow, and then study a close-up view. Mr. Foth pointed to a still photo of an ejection seat, at which point the seat rotated. Trainees can select close-up shots of a section of the seat, for example, or of a mechanical part.

HAZMAT awareness course. Mr. Grimm explained that the goal of this interactive course is to eliminate the potential for error when crews change and the new crew does not know a piece of equipment as well as the previous crew. On the basis of information studied previously, the trainee drags and drops different truck body parts to create the correct HAZMAT vehicle for the type of material being transported, for example a cryogenic liquid tank truck. If the user constructs the wrong type of vehicle on the third attempt, the correct answer is provided visually and orally.

In a section on vapor density, in addition to the text, the trainee sees an amorphous graphical blob in the upper right corner. As the user reviews various concepts or definitions, the blob morphs into visual representations of, for instance, ice, water, condensation, vaporization, or sublimation. Like many of the other multimedia courses, this HAZMAT CD offers periodic knowledge checks or performance evaluations. Mr. Grimm noted that the information contained in this course is applicable across all agencies that deal with hazardous materials disposal. The Air Force estimates that it is saving $16.6 million per year in travel costs by using this particular multimedia training package.

Discussion

Internet/Intranet Delivery

An attendee asked whether the Air Force multimedia courses are available on an Intranet or the Internet, using Shockwave. Mr. Grimm said that the firefighting services do not have this capability.

Updates and Working with Contractors

An attendee asked how the Air Force handles updates when contractors are used to develop the multimedia courses. Mr. Grimm noted that voice-over changes, for example, are relatively inexpensive to make; for more complex changes, the Air Force has its own programmers. In response to additional questions about using contractors, he said that OPM had held a competition several years before and approved 16 courseware developers in the Washington, D.C. area. The Air Force chooses among the approved firms. If the Air Force uses contractors, everyone involved generally uses the same design templates. To maintain uniformity across certain courses, the Air Force sometimes reuses the same contractor.

Multimedia Development Team

The multimedia development team includes a manager (Mr. Foth's role) or executive producer who is responsible for pulling together the resources. The team also includes instructional designers, graphic artists, animators, computer programmers, script writers, and subject matter experts. Air Force personnel and contracting staff often multitask (assume multiple responsibilities).

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Metapraxis: Transforming Learning Through Technology

David Lamp, Graduate School, U.S. Department of Agriculture

Session Overview

This session demonstrated how learning environments, or as Mr. Lamp put it, "transformational learning approaches," can be and have been built, where time is not a constraint and space does not constrict the process. Rather than demonstrating specific technologies, Mr. Lamp's presentation focused on some of the fundamental concepts and ideas that formed the framework of the Graduate School's technology-enabled learning system. He invited the attendees to experiment with some of these concepts as catalysts for transforming their own learning systems, and to tell him which of these concepts worked, and which did not.

"Metapraxis" and Its Derivation

About 20 years ago, Mr. Lamp related, he discovered a series of essays by Robert Greenleaf, on the servant as leader. Invoking a parable by Hermann Hesse, this book articulates the essence of such an individual: a guiding spirit who is seemingly a servant but is actually "a great and noble leader." Mr. Lamp suggested that, through technology, the learning process can be transformed so as to empower people to become these kinds of leaders: individuals who are available, and are equipped to share their experiences with others.

Adopted loosely from the word "metamorphosis," Mr. Lamp continued, the word "metapraxis" denotes a practice of transforming instructional style from a focus on lecturing, to an emphasis on rendering assistance—facilitating learning instead of prescribing it.

Pairs of Pairs

In most fields of endeavor or knowledge, Mr. Lamp observed, pairings seem to occur, where four groups work together in two pairs. The book *Beyond Einstein* describes how our vision of the world is profoundly affected by our science; the Newtonian world, for example, was thought of as orderly; the Einsteinian universe, in contrast, emphasized the relativity of things. Current scientific reasoning, with its discovery of black holes, quarks, and leptons, posits a complex sub-atomic world: one with 54 elementary particles arranged in 16 different levels.

Elaborating on this theme, Mr. Lamp suggested that bipolar organization into foursomes can be unearthed in many of the arrangements we use to order our world. He then discussed a number of examples.

Culture and its evolution. The simplest societies were those of tribal nomads, paired as **hunters** and **gatherers.** More complex, and historically more well-regarded, societies are paired as **farmers** and **merchants**. Recent work in psychology has suggested that attention deficit disorder

is not purely detrimental; the psychology of the impulsive mind was not only required to survive in an unmanaged world, but may also have benefits in today's society. Conversely, the merchant or farmer requires planning in order to optimize the society's cultural orientation around predictable and controllable logistical support systems. In training, Mr. Lamp suggested, the latter paradigm—a linear, predictable world about which students receive lectures and on which they are tested—is usually emphasized. Now, however, the world view—circular and thus nonlinear—of the tribal nomad (hunting and searching), as a basis for training, is gaining more adherents; this is partially due to the increasing ubiquity of the Internet.

The divergent economy and dualistic society. In an economy, Mr. Lamp suggested, individuals look to maximize four freedoms, arranged in pairs of two: **power** and **money**, and **time** and **space**. People generally rank themselves according to how much power and money they have, access to both of which are enhanced by the Internet. Time and space are barriers to overcome. These are often discussed in the context of distance learning, which should not be, however, merely a replacement of physical space with virtual space. Rather, virtual space is an entity valuable in and of itself; it should not be used simply as an attempt to replicate physical space. The opportunity provided by the Internet's virtual space empowers the learner with a powerful tool to do whatever the learner needs to, Mr. Lamp suggested, thus encouraging the learner to be more confident and enthusiastic.

Making a culture: the four roles of bipartisan leadership. From his experiences in videoconferencing training, Mr. Lamp observed that individuals seem to inhabit, often simultaneously, four different roles: those of the **king, magician, warrior,** and **lover**. The king (or monarch) tries to create order in his life by the imposition of a system; the magician tries to find some guiding vision for his life, that is grounded in certain values; the warrior tries to defend that perspective; and the lover tries to nurture a society that has those qualities of order, vision, and procedure. In a virtual environment that entails a greater degree of intimacy, these principles can be shared more readily. For example, students are more willing in a virtual environment to question a choice of curriculum, or the quality or pace of the training; in such a virtual environment, people are generally more impulsive and forthright in their requests.

Making a personality: the four factors of the bicameral mind. In getting to know his "faceless" audience for his distance learning classes, Mr. Lamp observed, he conducted an exercise to characterize the students' needs. The exercise uncovered pairings of contrasting personalities: those who were **extroverted** as opposed to **introverted**; those who were **intuitive** versus those who relied on **sensing**; those who relied on **thinking** versus those who relied on **feeling**; and those who emphasized **perceiving** versus those who emphasized **judging.** This helped him as an educator; validating these aspects of personality helped both kinds of students.

Making a species. The four ingredients of the double helix strand of DNA, the basic building blocks of life, bond in twos as well: **guanine** and **cytosine**, and **thymine** and **adenine**. Just as biology works in this base four, computer science works in the base two, yes/no binary system. There may be the opportunity in the future to create an "organic computer" that works in base four, with a translator operating in the binary system—an example of the kinds of possible

groupings in the future, leading to computers with capabilities expanded beyond the yes/no binary paradigm.

The Learning Process and the Use of Technology

The process. There are three stages of the learning process, Mr. Lamp noted:

- Prerequisite learning, or self-study
- Facilitative learning, using a mentor or coach
- Reflective learning, which is questioning what was acquired during the first two stages.

This process is an endless cycle; learning is no longer a linear event. This conception of learning complements the pairing arrangements that so order the world, Mr. Lamp observed; this model of "telecyclic thinking", he suggested, can be used as a framework for determining the best use for various technologies:

- Prerequisite learning tools, such as CD-ROM and the Internet, allow people to learn at their own pace, gathering and reviewing basic information.
- Facilitative learning, that uses technology-enabled learning, would occur after the prerequisite learning stage has been negotiated. The team aspect of learning would be stressed here.
- Reflective learning is applying, and critiquing, what a student has learned, in conjunction with a community of those the student learned along with. In this stage, after their facilitative learning, students create virtual communities through E-mail and Internet webs with one other, thus enhancing the ongoing learning experience—by, for example, lending each other books and then discussing them.

When people become intrigued with learning, he continued, they are generally trying to define for themselves their role in their organization, and what it means to be in their position and have their particular set of skills. When an individual asks, "Who am I?" it is in response to stimuli from the physical world ("what I sense"); the mental world ("what I think"); the spiritual world ("what I value"); and the social world ("whom I am with").

How do I know what I know? There are three aspects to what an individual knows, Mr. Lamp observed; these are the components to consider when deciding what to put into learning modules in a multimedia environment:

- What is the **theory**; what does it do? What are the facts?
- What is the **metaphor**; what is it like? These metaphors need to make sense; all great teachers use them, however.
- What is the **practic**; how is it used? This involves learning by doing.

Theory, or the acquisition of data, Mr. Lamp continued, has three components:

- Facts, transmitted through words and using definitions and theorems
- Figures, transmitted through numbers and using charts and formulas
- Forms, transmitted through shapes and using graphs and models.

Some people learn best through words, others through numbers, and still others through pictures. Effective communication uses all three.

Metaphor embraces the emotional or sensory aspect of learning. Art is a form of sensory learning, that comes in three manifestations:

- Physical art (dance and sculpture) is art that is either in motion or static.
- Mental art (poetry and fiction) is either rhythmic or asymmetrical.
- Spiritual art (music and painting) is either tonal or visual.

Art can be used to unlock an understanding of the individual student; by asking the student what kind of art most appeals to him, the student can then be provided with the approach to learning most appropriate to him as an individual.

Practic, or learning by doing, has three aspects as well:

- Skill: how to do it. For example, how to turn on the car; how to shift into gear.
- Technique: how to do it better. For example, how to drive and how to park.
- Interpretation: why is it done the way it is. For example, how to be a professional driver; whether to be a professional driver.

Learning, Mr. Lamp continued, also has a social dimension, or learning by joining. This includes determining who one's peers and mentors are.

The process, then, is: Once a learning need is established, there is a decision on the appropriateness of the learning tool, the learning style, and the learning system. Then the learning needs to be validated in its cultural context. The aim is enhancing understanding.

Real world application. This process is the basis for building a collaborative learning system, Mr. Lamp stressed, a project that the Graduate School, U.S. Department of Agriculture (USDA), in fact, has been involved in recently. This initiative started with the Rural Internet Training Environment (RITE), created to shape learning modules for World Wide Web use. Recently, this nascent effort has been expanded into an off-the-shelf system that is subdivided by learning styles and organized by learning system. This new product is Harbinger™, due to be mature and available at the Graduate School's Web site by the end of January, 1998. The intent is to provide this tool to anyone; comments on it are welcome, he added.

In turn, he continued, Harbinger™ will be used to construct AmeriSchool™: a system to break down, then sort and reorganize relational learning information into a database, which can then be used to observe and monitor student learning and mentoring. Such a tool will facilitate collaboration on learning outcome management, and allow the Graduate School to leverage more effectively the investment of its partners; the ultimate aim is to enhance electronic learning with a tool that can be adapted to agency-specific needs, while incorporating in its development enough collaboration to avoid duplicative effort.

Companies and governments need to collaborate and share technologies where feasible; there need not be, for example, 27 different modules on sexual harassment for 27 different companies.

The money saved by such collaboration could then be used to enhance company-specific (or even individual-specific) learning modules. If the goal is metapraxis—the ability to create transformational learning—then the techniques to sort out, re-order, and describe that learning are available: techniques that can be ably supported by new technologies, such as filtering software.

Discussion

Linear versus Relational Learning

An attendee asked how prerequisites, and the often linear nature of the learning process, could be accommodated by the significantly different process implied by building learning modules according to a relational learning philosophy. Mr. Lamp acknowledged this is a controversial subject; if the necessary results are defined, and the prospective students are motivated, then this dilemma can be negotiated. A teacher will create the learning modules based upon his own learning style and way of gathering information; the teacher's learning modules could then be characterized according to that personal style, and this would help the student when choosing among modules.

A possibility, Mr. Lamp continued, would be to use filtering software to create student learning profiles, and then to program the computer to monitor what transactions an individual student makes, thereby verifying the accuracy of the predictions of student choice. This filtering software is now available, and is improving all the time. Eventually, all the different learning styles needed to accommodate the variety of students' needs would be created. For this system to work, he advised, it would require there be an accountable relationship between student and teacher to validate that the information that had been initially identified is fitting.

When making up their lesson modules, he continued, instructors need to dissect and re-categorize information with these principles of metapraxis in mind; configuring modules would be aided by a relational database with a search engine, and modules subsequently manufactured would be customized to an individual student's specific needs, attributes, and learning style. A complementary system would then monitor the student's progress through that module. By learning what teaching is really about, and dividing up into modules, the whole concept of education may be reinvented, and for the better, he maintained.

Importance of Correct Categorization

Another attendee observed that the airline industry is involved in a similar initiative, called the Aviation Industry CVI group. A system of sorting identifies the pieces of learning that work. Pieces of learning need to be placed in the right category, however; concepts belonging in "values" should not be placed in "theory," for example.

The Teacher as Facilitator

It is important to reassure teachers that transformational learning principles will not cost them their jobs, Mr. Lamp stressed. As teachers become more "facilitative" using this kind of "chunk learning," student enthusiasm will be kindled. By helping students become acquainted with their own capabilities, instead of imposing tasks on them as they pursue professional credentials—in acting, so to speak, as the servant—teachers will find their own teaching experience to be more rewarding as well, and will become, like the servant in Hesse's work, leaders.

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Strategies for Evaluating Distance Learning Events

Robert A. Wisher, Ph.D., U.S. Army Research Institute
Christina K. Curnow, U.S. Army Research Institute

Session Overview

Introduction

This session was designed to provide guidelines for evaluating distance learning events based on evaluations, conducted over the last three years, of distance learning training events in the Army National Guard. The session covered the following topics:

- Why bother to evaluate?
- Developing a concise evaluation instrument
- Sample findings from data analysis
- Analyzing cost effectiveness
- Analyzing and evaluating the delivery of hands-on skills training via distance learning.

Dr. Wisher and Ms. Curnow provided sample evaluation forms used to collect distance learning data, and demonstrated an application of the SPSS software to analyze a set of data. After a general discussion of the session topics, the presentation focused on the evaluation strategy used to evaluate hands-on skills training for air traffic control operators delivered via distance learning. The strategy involved comparing the traditional, eleven-week residential training program to the experimental 44-week distance learning program. The session concluded with a discussion of lessons learned about conducting evaluation studies of distance learning, and a presentation of the evaluation results for these particular Army National Guard courses.

Why Bother to Evaluate?

Since the Army National Guard intends to have distance learning facilities at every armory, available to anyone, they needed to be able to verify the results and judge the cost effectiveness of their courses. Objective proof was needed to gain agency support for distance learning and inform policy makers. Also, in the current environment of total quality and continuous improvement, evaluation data would allow the Army National Guard to identify which types of training can be successfully delivered through distance learning, and to learn from examples of unsuccessful attempts.

Army National Guard Distance Learning Training Events. The Army National Guard training events that were evaluated shared the following characteristics:

- Short-term—one day or less
- Not practical for knowledge tests
- Required on a regular basis (including directed training, opportunity training, and new command emphasis).

Types of Evaluation Measures. Four kinds of results were measured:

- Reaction
- Learning
- Transfer
- Results.

Reaction measures were used to obtain information that would help gain agency support by providing some evidence the students liked the distance learning version of the course; and, to provide feedback to providers, instructors, and technicians. Paper and pencil measures were used to obtain information on how well the students learned facts, principles, rules, and procedures. Hands-on measures were used to find out if the students learned skills. Self-assessment measures were used to gather subjective data on how much the students felt they had learned, which were then cross tabulated with the results of the performance tests.

The Army National Guard students tend to be very honest and direct in their answers to self-assessment questions. When self-assessment is followed by real skills tests, there is a high correlation between student performance and their statements about how much they had learned in the course.

Strategies for a One-Page Instrument

A great deal of research was conducted to design the current one-page instrument used by the Army National Guard. Researchers looked at examples of distance learning course evaluation instruments used by other organizations and examined the number of pages, the number of categories of feedback, the response types, and the rates of return. All of these factors were considered in designing the current one-page instrument.

Return rates. The researchers determined that return rates are affected by—

- Length of the instrument (based on a study of 8,000 students, 20% higher return rate when the instrument was limited to one page)
- Saliency of questions (keep the questions relevant to the course; don't ask too many demographic questions)
- Confidentiality
- Convenience of return (when pre-addressed return envelopes were given to site coordinators, and site coordinators required that instruments be completed before leaving the training site, 75% were returned within 2-3 days).

Categories of feedback. There were five main categories of feedback obtained through the use of the one page instrument:

- Demographics (rank, education, age, full tour, travel)
- Course (taped, previous learning on subject, how much learning, relevant to job, learning environment)
- Technology (audio, video, etc.)

- Instructor (effectiveness, opportunity to ask questions, responsiveness)
- Motivation (importance of course to job/duties).

Rating scales. The researchers determined it is best to use a 5-point scale, anchored by labels on extremes at each end, with nothing in between.

Items. The following factors were evaluated:

- Location of video screen
- Quality of audio
- Quality of video
- Instructor effectiveness
- Opportunity to ask questions
- Responsiveness to student questions
- Relevance of course to Guard duties/job
- Overall learning environment
- Overall effectiveness of instruction.

A copy of the instrument is provided at the end of this summary.

Analyzing Results

Demographic findings. The researchers used *SPSS for Windows* to analyze the data. The presenters displayed one example of the data analysis—looking at age versus the amount learned. There was no significant difference in the amount of reported (self-assessment) learning between older (> 41) and younger students.

The presenters showed the results of the demographic analysis and the amount of reported learning (self-assessment) for several courses. More than half of the respondents with no previous courses in the subject, reported that they learned a lot. And, even among those with previous course work in the subject, nearly half reported learning a significant amount.

One interesting finding concerned the relationship of the course ratings to the amount of time traveled to the training site. The farther the students had to drive to reach the site, the worse they rated the course. As a result of this information, the Army National Guard is striving to keep the maximum driving time to reach an armory within one hour.

Analyzing cost effectiveness. The questions "Is it saving us money and is it worth doing?" are often asked of distance learning training. Performance data, costs, and assumptions such as inflation factors, numbers of attendees, and technology trends are key to answering this question. The information obtained from evaluations will help identify the break-even point.

Data was provided for an example of a cost-effective distance learning course. The residential Unit Clerk Course was compared to the audio teletraining version of the course. There was a net savings of $1,087 per student, with projected fiscal year 97 savings of $304,360. One hundred

percent of the students in both courses graduated; the students in the distance version actually mastered the tasks faster than the residential students.

Evaluating the Delivery of Hands-On Skills Training via Distance Learning

To evaluate the effectiveness of hands-on skills training delivered via distance learning, the air traffic control operator training course was used. The performance of the students in the residential course was compared to the performance of the students in the distance learning course.

Knowledge components of courses taught via distance learning—facts, principles, rules, and procedures—were tested through paper and pencil evaluation. Hands-on skills were tested through real-time, action responses to simulated events.

Results. The scores on the knowledge components of the practical exercises were very similar for the residential and the distance students. For many topics, the distance learning student scores were higher. However, in the scores on the skills tests (simulated tower and radar events) there was a significant difference in the other direction. Only 14 percent of the distance students passed the radar hands-on tests, compared to 85 percent of the residential students. And, only 58 percent of the distance students passed the tower hands-on tests, compared to 90 percent of the residential students. This proved to the Army National Guard that this phase of this distance learning course did not work.

The researchers stated the following reasons for the lower distance learning skills scores:

- Distance students had to wait two months after finishing the knowledge components of the course to apply the knowledge in the hands on skill tests; thus there was a significant amount of knowledge and skill decay.
- Distance students did not have as many opportunities to practice in the simulated conditions before being tested; the residential students had multiple practice opportunities.
- Distance students had to pass the skills tests the first time they were tested; residential students had multiple chances to pass the skills tests.

Lessons learned. The researchers drew the following conclusions from their evaluation study of hands-on skill training delivered via distance learning:

- Knowledge components of hands-on skills are very effectively taught via distance learning.
- Skills components are demanding to teach, must be individualized, and must allow repetitive practice.
- Knowledge decay will occur if there is a delay before application to skills.
- Attrition factor was too high, nearly 50%; organizational issues must be addressed.

Summary

The presentation was concluded with the following observations:

- Distance learning evaluations are worthwhile.
- The one-page concise instrument is effective and is available for agency use.
- The most valuable data is the cross tabulation of previous training and self-assessment of learning measures.
- Use a one-page instrument to get a quick picture of return on investment and cost savings.

Discussion

Form Design

An attendee asked if the researchers had noticed any adverse effects of using a form without any space for comments. Dr. Wisher answered that comments are more useful in the formative evaluation phase. He also pointed out that students will write comments on the back of the form if they really want to.

Subjective Measures

An attendee voiced concern that the self-assessment measures are merely "exit" polls and that, as such, they are too subjective. Dr. Wisher replied that in the Army, the subjective format works (because the students are accustomed to self-assessment answers, and studies show their answers tend to be honest when compared to objective measures of how much they have learned) and matches up with the skills transfer measures. He explained that they feel it is acceptable in the Army environment to use the one-page format to get a quick snapshot, a quick picture of the event's effectiveness, to give to policy makers and funders.

Transfer of Skills

An attendee asked if the study had measured how much the students remembered some time after the conclusion of the courses. Dr. Wisher answered they did not study how well the students retained the knowledge and/or skills after the courses ended.

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Distance Learning Evaluation Sheet (Revision)

Location of training _____ City _____ State

Today's Date: ____/____/____ Day Month Year

1. What is your rank?

- ◯ E1 toE4
- ◯ E5 to E9
- ◯ Warrant Officer
- ◯ 2LT, 1LT, or CPT
- ◯ MAJ, LTC, COL or higher
- ◯ Other _____

2. Was this a live event or a videotaped version? Mark One.

◯ Live ◯ Videotaped

3. How important did you feel it was for you to attend this training? Respond using the five point scale below.

Not important at all 1 2 3 4 5 Very important

4. Have you had previous training related to today's training topic?

Yes ◯ No ◯

5. Compared to what you already knew about topics related to today's training, how much more did you learn in this training event? Respond using the 5 point scale below.

None 1 2 3 4 5 A Lot More

6. About how many other interactive TV training events similar to this have you previously participated in?

	None	1 or 2	3 or 4	5 to 10	10 or more
For Guard/Reserve training?	◯	◯	◯	◯	◯
For your civilian job?	◯	◯	◯	◯	◯
For education or occupational training?	◯	◯	◯	◯	◯
For other interests (e.g. hobbies etc.)?	◯	◯	◯	◯	◯

7. Please respond to the following questions using a five point scale with 1 being "Poor" and 5 being "Excellent." From your vantage point, how would you rate:

	Poor				Excellent	Not Applicable
Location of the video screen:	1	2	3	4	5	◯
Quality of audio:	1	2	3	4	5	◯
Quality of video:	1	2	3	4	5	◯
Instructor effectiveness:	1	2	3	4	5	◯
Opportunity to ask questions:	1	2	3	4	5	◯
Responsiveness to student questions:	1	2	3	4	5	◯
Relevance of course to Guard duties/job:	1	2	3	4	5	◯
Overall learning environment (i.e., lighting, distractions, room size, etc.):	1	2	3	4	5	◯
Overall effectiveness of instruction:	1	2	3	4	5	◯

8. How long did it take you to travel to this training facility?

◯ 1 to 29 min. ◯ 30-59 min. ◯ 1-1 1/2 hours ◯ 1 1/2 hours or more

This information is being collected in accordance with the Privacy Act of 1974. Information on individuals is confidential and will not be released to anyone. Group information will be used only for research and policy analysis.

Audio Conferences: Distance Learning's Sleeper

Michael L. G. Berney, Federal Judicial Center
Judith F. Roberts, Federal Judicial Center

Session Overview

Audio Conference Demonstration

At the beginning of this session, Symposium participants listened to an audio conference between judiciary employees and Mr. Alfie Kohn, an expert in the field of rewards and incentives, who is experienced in delivering audio conferences.

Symposium participants could hear the different judiciary employees—50+ court unit executives from around the country—join the conference call and greet one another. This was the first contact with Mr. Kohn for most of the judiciary employees heard in the audio conference. Mr. Kohn welcomed all the participants, gave a five-minute overview of the subject matter, and then put forward questions and asked the judiciary employees to comment.

Symposium participants listened to the audio discussion for approximately 15 minutes before turning their attention to the presentation on audio conferences at the Federal Judicial Center by Mr. Berney and Ms. Roberts.

Background

The Federal Judicial Center (FJC), was created in 1967 as the research and training arm of the judiciary. At the FJC, Mr. Berney has conducted eight audio conferences, each involving three calls. Audio conferences have been used for clerks of the court, court unit executives, and other judiciary employees.

What is an Audio Conference?

In response to a question about the difference between an audio conference and a conference call, Mr. Berney and Ms. Roberts indicated that in the judicial culture, a conference call is a business meeting conducted via telephone. An audio conference is a mechanism to convey content and spread out the time requirements.

Audio conference participants are required to do a variety of activities on their own. Participants receive a bound handbook that outlines the goals and objectives of each segment of the conference. Ms. Roberts likened the structure of the audio conference to that of a traditional training program. Participants are expected to read materials before the audio conference begins and to participate during the call.

Planning for an Audio Conference

Preparing a guest speaker. Mr. Berney said that he worked with Mr. Kohn in advance to set up the criteria and subject content of each audio conference. He also worked with him to set the ground rules for the participants, the flow of the conference, and ways to generate participation. Guest speakers can be outside subject matter experts or in-house personnel qualified to talk on the subject.

Using a moderator. Usually, Mr. Berney acts as the moderator during the audio conference. He greets people and moves the program along. He recommended a neutral moderator—an individual without a stake in the conference or subject matter. Mr. Berney also spoke of the benefit of having an assistant to help greet people, monitor sound quality, and resolve technical problems. He encouraged the moderator and assistant to outline each conference and rehearse their roles in advance.

The flow of the conference. Generally, the speaker makes a point in a five-minute presentation and then poses one or two questions to which the participants are asked to respond. The speaker is in control, Mr. Berney pointed out, and runs the audio conference as though he or she was in front of a more traditional classroom. It is important that the speaker be concise and organized.

Establishing ground rules. The ground rules for the audio conference are listed in the audio conference participants' handbook distributed to participants ahead of time. FJC ground rules for participants include—

- Say your name before you ask a question or offer a comment.
- Contribute—ideas, questions, experience, concerns, dilemmas.
- Be brief. Don't speak for a minute when one sentence will suffice.
- If you are using a speaker phone, use mute if possible when you are not talking and be careful not make noise that may carry.

A member of the audience asked what to do if more than one person talked at once. Both Mr. Berney and Ms. Roberts said that this hadn't been a problem. If this could be a potential problem, guidelines should be included in the ground rules.

Sometimes it may be desirable to encourage more participants to join the discussion. As the moderator, Mr. Berney said that he might ask a specific individual for input. He cautioned that if this is a possibility, then the ground rules should include the fact that any participant may be called upon for an answer or opinion.

Implementing an Audio Conference

The audio conference is set up much like a conference call. Ms. Roberts recommended putting a time limit on the call and interjecting a warning when the call will be ending in approximately 15 minutes. She suggested that agencies arrange with their phone provider to monitor the conference and ensure that audio quality remains constant. An attended call is preferred over an unattended call.

Participants are encouraged to use speaker phones or headsets so they can take notes easily. Mr. Berney suggested using a room "off the beaten track." Oil creaky doors and stay away from windows through which traffic and sirens can be heard. He also suggested having paper available so group members can exchange comments without speaking.

The times of the audio conferences are established well in advance, and participants are asked to call in 20 minutes early to sign up. They can then either stay on the line until the designated time or hang up and call back.

The audio conferences are advertised approximately two months in advance. In addition to receiving a handbook in advance, participants are asked to complete exercises and readings.

Mr. Berney said that they created a mechanism to track which individuals responded during the conference. As the moderator, he works to encourage quieter participants to respond in subsequent conferences.

Mr. Berney and Ms. Roberts stated that no minutes have been taken during the FJC audio conferences, and participants have not been recorded, because they felt that the individuals should feel free to speak their minds. They also wanted participants to take the initiative and makes notes themselves.

Participants also were not tested on the information conveyed. The goal of the audio conferences was an exchange of information. Evaluations have shown that people are using the information gained in the conferences.

Benefits and Keys to Success

Ms. Roberts said that audio conferences have enabled important information to be disseminated to judiciary employees that could not easily have been conveyed otherwise. The conferences provided a way to focus structured time on a topic.

She credited the success of the audio conferences to the engaging topics and the interest of the participants. If the topic is not of interest or is too broad, it will not have the same appeal. Ms. Roberts recommended making operational issues as narrow as possible.

Judiciary employees joined the audio conferences on a voluntary basis. Both Mr. Berney and Ms. Roberts attributed the success of the audio conferences to employees' willingness to participate.

The audio conference, in some situations, provided the anonymity needed to help individuals open up and more freely discuss their feelings. One conference involved role playing with participants to help them deal with stressful situations.

Another benefit of audio conferences cited by Ms. Roberts and Mr. Berney was an increase in networking among conference participants. People began calling one another and discussing ways to resolve issues.

Discussion

Holding Participants' Interest

One audience member stated that his attention wavered during the demonstration with Mr. Kohn. Later in the discussion, he indicated that the reason might have been his prior knowledge of Mr. Kohn and his preference to see him in person. Mr. Berney responded that having Mr. Kohn in a classroom situation would be ideal, but not feasible. This was the next best way to present him and his information.

Another audience member said that he preferred this method in some ways because the rich images in a video can be distracting. He felt that with a dynamic speaker and interesting topic, audio conferences could hold the attention of participants who wanted to learn more about a particular subject.

Mr. Berney concluded the session by observing that, just as for any other training program, you have to know your audience and subject matter to create a successful audio conference.

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Review of the Literature: Interactive Video Teletraining in Distance Learning Courses

Hank Payne, Federal Aviation Administration

Session Overview

In 1997, the United States Distance Learning Association published a review of representative studies related to the use of Interactive Video Teletraining (IVT) in conducting distance learning courses. Presenter Hank Payne, who compiled the review under the sponsorship of GE Capital Spacenet Services, Inc., focused on four areas of study:

- Learner achievement
- Learner satisfaction
- Interaction
- Student response systems.

Mr. Payne presented his findings in this session.

Background

Teaching by television is not a new concept. In fact, it has a credible history that spans six decades. Iowa State University began broadcasting courses as early as 1934, and by 1948 at least eight universities were broadcasting educational programs regularly. The first Instructional Television Fixed Service license was granted to a New York school system in 1961, and cable television networks have been required to provide educational channels since 1972. Some of the more than 800 published and unpublished studies identified in the literature review are as much as 30 years old.

Mr. Payne, who delivers one-way video, two-way audio IVT at the Federal Aviation Administration (FAA), began the literature review as a search for discernible answers to questions about the effectiveness of distance learning, and why—60-plus years after the first broadcasts—we are not doing more of it. He initially undertook the project as a Ph.D. dissertation, but over time it became apparent that a need existed for a comprehensive document that the distance learning community can use to promote and sustain distance learning.

Review Process

Conducted over a three-year period beginning in 1994, the literature review includes selected, representative samples from more than 800 published and unpublished studies. The results summarize the outcomes of the representative studies, providing distance learning practitioners with a concise record of what is—and is not—stated in the literature.

From the available literature, Mr. Payne chose representative reviews and individual studies in each of the four areas of focus. In the area of learner achievement, he selected 12 literature

reviews and meta-analyses and 8 individual studies from more than 800 studies addressing achievement. The review also summarizes one meta-analysis and 12 individual studies out of more than 100 academic and government studies addressing learner satisfaction, 20 individual studies addressing interaction in instructional television, and 28 individual studies on the effects of using student response systems in a distance learning environment.

Findings

Mr. Payne was able to draw conclusions from the literature regarding each area of focus. He described them to the session attendees as follows.

Learner achievement. Although students learn differently in a distance learning environment than they do in a conventional classroom setting, they usually learn as much, and sometimes more. These results are global, i.e., independent of demographic factors such as age group. Some studies described tests in which televised and face-to-face versions of the same class were directly compared. Other studies compared achievement results in different ways, but the results were always the same: distance learning students consistently achieve at least as much as their conventional-classroom-trained counterparts.

It is unlikely that the literature can support a claim that distance learning results in greater achievement. However, the finding that students learn equally in either environment can be a strong argument for distance learning, especially when used in concert with the clear advantages of IVT. Those advantages include significant reductions in student/instructor travel, increased class sizes (when broadcasting to several locations at once), and consistent delivery of training (i.e., fewer deliveries by a smaller instructor team results in fewer opportunities for disparate interpretations of a training message).

Learner satisfaction. A majority of students prefer face-to-face instruction to distance learning, but satisfaction with distance learning does not appear to affect achievement levels. In short, students learn in a distance learning environment whether they enjoy it or not. It might be concluded, therefore, that in cases where large numbers of people need to be trained in a limited time with limited resources, learner satisfaction may not be an important consideration in choosing a teaching method.

Satisfaction, however, can have an impact on a distance learning program's success. Students who do not enjoy the experience may choose not to take another distance learning course, even though they achieved their learning objectives. These students can also have a negative influence on others who have not yet experienced distance learning themselves.

Interaction. Two findings emerged from the review in regard to interaction. First, a learner's perception of interaction appears to affect his or her level of satisfaction. Even students who do not participate themselves express higher satisfaction with a distance learning course if they see others participating. Second, there is no relationship between perceptions of interactivity and achievement levels attained, i.e., achievement is constant whether or not a student feels a course is interactive, and increased interactivity will not raise achievement levels.

These findings fly in the face of conventional beliefs about the value of interactivity in the classroom. Mr. Payne expressed his personal belief that interaction is important—relevant, frequent, thought-provoking interaction. Nevertheless, the literature does not support this contention.

Response systems. Research in this area is limited, and more is clearly needed. From the studies available, it appears that student response systems that provide voice and data capabilities, e.g., keypads, can increase learner achievement, satisfaction, and interaction in some instances. Other technologies, however, can be less costly (e.g., push-to-talk); the decision as to which system to use should be based on application. Factors to consider include type of class, student demographics, and the importance of interaction in the course.

Discussion

Learning Equity

Asked whether distance learning technologies might, in any way, promote the distribution of training opportunities more equitably throughout an organization, Mr. Payne responded that he has found no literature specifically addressing that question. He noted, however, that in his experience at FAA, satellite technology enables him to train a greater number of people.

Remote-Site Class Size

FAA shares the remote-site resources of the U.S. Department of Defense. In response to a question about the number of people who can be trained at each site, Mr. Payne indicated that FAA has access to 340 classrooms, most of which are equipped for five students learning in an IVT environment. The rooms are large enough, however, to accommodate 25 people. In time, more will be learned about the number of people who need to attend training at the various sites. If warranted, classrooms can be equipped to accommodate larger IVT classes.

Travel and Classroom Time

IVT is reducing travel time for students. Mr. Payne noted, in response to a question, that few FAA personnel need to travel great distances to receive training today. When FAA first began offering IVT, employees in remote areas such as Montana had to travel considerable distances to reach the nearest FAA training facility. However, with more and more shared government facilities becoming available, even personnel in remote areas can travel to and from a training site in a single day.

To accommodate travel time and coordinate among students in various time zones, training days are typically limited to four hours. On occasion, courses originating from the East Coast are rebroadcast later in the day for West Coast participants.

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Distance Learning Resource Handbook

Lt. Col. Fred Vornbrock, U.S. Air Force

Session Overview

In response to many calls for a single handbook of the various distance learning resources available, the Air Force Distance Learning Office developed the *Distance Learning Resource Handbook.* Lt. Col. Fred Vornbrock presented the handbook to the Government Learning Technology Symposium via satellite from Air University, Maxwell Air Force Base, Alabama. He utilized "push and talk" technology to field questions and comments from participants.

Resource Handbook Organization

Called an "Internet compass" by Lt. Col. Vornbrock, the handbook is a compilation of facts about distance learning and sources for more information on the topic—both online and off. Because the field is advancing as rapidly as the online research tools available to its practitioners, the handbook is updated regularly. The 15 December 1997 version, which Lt. Col. Vornbrock presented, is a concise document (fewer than 40 pages) organized topically into 15 sections:

- Definitions of Distance Learning
- Distance Learning Glossary
- History and Quality of Distance Learning
- Distance Learning Conference Calendar
- Distance Learning Certification Programs
- Listservs on Distance Learning
- Usenet NewsGroups on Distance Learning
- On-Line Distance Learning Primers
- On-Line Distance Learning Resources
- Distance Learning Organizations
- Distance Learning Periodicals
- On-Line Distance Education
- Copyrights and Distance Learning
- Distance Learning Books
- Bookstore.

Resource Handbook Contents

Lt. Col. Vornbrock briefly reviewed each section of the handbook, showing examples of the many World Wide Web sites identified in the handbook as he progressed. He reviewed the sections in the order in which they appear in the handbook.

Definitions of Distance Learning. The opening section captures some of the many definitions of distance learning. Lt. Col. Vornbrock noted that the definition varies from one organization to another. For instance, the Air Force includes correspondence courses within its definition, but the

American Society for Training and Development does not. It is not the definition that matters, he said. What matters is that we understand what the assumptions are.

The handbook contains 13 distinct definitions of distance learning. It also refers readers to online compilations of distance learning definitions sponsored by Pennsylvania State University *(ftp://ftp.cc.psu.edu/pub/people/cx118/summary/distance.txt)* and the University of Wisconsin *(http://www.uwex.edu/disted/definition.html)*.

Distance Learning Glossary. This section presents a glossary of 59 commonly used distance learning terms. Some terms are specific to distance learning as it is applied by the U.S. Air Force, while others are used broadly in the field. Many address distance learning technologies, e.g., "video teletraining" and "Web based training."

The glossary concludes with a list of six university, organizational, and corporate Web sites offering additional definitions.

History of Distance Learning. This succinct section provides a glimpse at the 200-year history of distance learning and its role since 1950 within the Air Force. It also recommends both online and print sources of more information on the topic.

Quality of Distance Learning. The results of more than 200 studies indicate that properly designed courses offered at a distance are as good as or better than traditional classroom courses. The handbook refers readers to a comprehensive online listing of these studies: *The No Significant Difference Phenomenon*, by Thomas L. Russell *(http://teleeducation.nb.ca/phenom/phenom3.html)*. It also refers to a recent literature review by Hank Payne, *Interactive Video Training In Distance Learning Courses* (presented to the Symposium by Mr. Payne).

Distance Learning Conference Calendar. This is a listing of more than a dozen conferences on distance learning planned during 1998. For each conference the handbook provides the title, date, location (all are within the United States), and a Web address (URL) where more information is available. Also provided are URLs for a site hosted by the University of Wisconsin *(http://www.uwex.edu/disted/conf/index.html)* offering the latest information on distance learning conferences and an Open University site with information on international conferences *(http://www-icdl.open.ac.uk/info/conferences.html#2)*.

Distance Learning Certification Program. There are several certification programs in the area of distance education. The handbook lists four of them: the Distance Learning Certification Program of the Texas A&M University Center for Distance Learning Research; the University of Wisconsin's Certificate of Professional Development in Distance Learning; the Teletraining Institute's Certified Distance Learning Instructor Program; and the Distance Education Training Council's Evaluator Training Program. For each program, the handbook provides a contact name and telephone number as well as a Web address for more information.

Listservs on Distance Learning. Listservs are mailing lists on specific subjects connected via E-mail to subscribers. Subscriptions are free.

The handbook describes eight listservs of general interest to distance learning practitioners and provides instructions on how to subscribe to them. Of these listservs, Lt. Col. Vornbrock especially recommended DEOS-L, sponsored by the Pennsylvania State University's Distance Education Online Symposium.

For those interested in locating additional listservs, the handbook recommends *http://www.iTools.com/research-it/research-it.html*, a tool for searching listservs by subject; FTP routes to a list of listservs on adult/distance education compiled by J.H. Ellsworth; and *http://www.oak-ridge.com/ierdep1.html*, a Web site hosted by Oak Ridge National Laboratory that lists approximately 400 distance learning listservs, most targeted to specific courses.

Usenet NewsGroups on Distance Learning. Usenet NewsGroups are another way to share ideas on a given topic using E-mail. They are similar to listservs. The handbook lists selected NewsGroups of interest to distance learning practitioners, including one sponsored by the American Association for Collegiate Independent Study. It refers readers to *http://www.oak-ridge.com/ierdrep1.html* for a more comprehensive listing.

On-Line Distance Learning Primers. For those new to distance learning, the handbook offers the URLs for four sites offering primers on the subject. Of these, Lt. Col. Vornbrock recommended the sites hosted by the University of Wisconsin *(http://www.uwex.edu/disted/overview.html)* and the U.S. Navy Office of Training Technology *(http://ott.sc.ist.ucf.edu/).*

On-Line Distance Learning Resources. This section is a compilation of a variety of online resources for distance learning practitioners. Sites listed on these pages offer information on distance learning technologies, links to sites on related topics, answers to frequently asked questions, descriptions of thousands of available distance learning courses, and more. Lt. Col. Vornbrock especially recommended *http://www.uwex.edu/disted/welcome.html*, a distance education clearinghouse hosted by the University of Wisconsin, and *http://www.cdlr.tamu.edu/*, sponsored by the Center for Distance Learning Research at Texas A&M University.

Distance Learning Organizations. Numerous associations and other organizations have been established to promote distance learning and support the field's practitioners. The handbook describes 15 of these organizations, and provides street addresses, URLs, and telephone numbers for each of them.

Of the organizations listed in the handbook, Lt. Col. Vornbrock especially recommended that practitioners become familiar with the American Center for the Study of Distance Education *(http://www.cde/psu.edu/ASCDE/)*, the American Council on Education *(http://www.acenet.edu/productions/home.htm.)*, the American Society for Training and Development *(http://www.astd.org)*, and the Federal Government Distance Learning Association *(http://www.fgdla.org).* The Distance Education and Training Council *(http://www.detc.org)* can be an excellent resource for verification of whether specific distance learning courses are accredited.

Distance Learning Periodicals. Numerous magazines and newsletters targeted to the distance learning community are available in print, and many of them are reproduced in whole or in part on the World Wide Web. The handbook describes several of these periodicals, offering street addresses and telephone contacts, along with URLs for those that have Web sites. Lt. Col. Vornbrock especially recommended *Educom Review* as well as *CBT Solutions,* which does not appear in the handbook. The URL for *CBT Solutions* is *http://www.cbtsolutions.com.*

On-Line Distance Education. Thousands of college courses are available at a distance, including hundreds of graduate courses from dozens of academic institutions. A number of Web sites can help students find the courses that meet their needs. Many of these sites are identified on these pages, including *Bear's Guide to Earning College Degrees Nontraditionally (http://www.degree.net/core.html),* which, among other things, can help students learn whether specific educational institutions are accredited, and Peterson's Education Center *(http://www.petersons.com/preview/distance.html),* which provides links to institutions offering educational programs at a distance as well as useful information on financing education, studying abroad, summer programs, and special schools.

Copyrights and Distance Learning. This section lists several government and private Web sites offering general information about copyright law as well as information specific to copyrights and distance learning. Lt. Col. Vornbrock especially recommended *10 Big Myths About Copyright Explained (http://www.clari.net/brad/copymyths.html).*

Distance Learning Books. The final section of the *Distance Learning Resource Handbook* contains five pages of recommended reading on the subject of distance learning, followed by a list of bookstores (online and off) and publishers that make the recommended books available. Of the publications on the list, Lt. Col. Vornbrock especially recommended *Distance Education: A Systems View,* by Michael G. Moore and Greg Kearsley.

Discussion

Lt. Col. Vornbrock invited suggestions on ways to make the *Distance Learning Resource Handbook* more useful, and reiterated that the handbook is updated periodically. Updates are announced on the site of the Air Force Distance Learning Office *(http://www.air.univ.edu/afdlo).*

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Learning Technologies and Total Army Training System (TATS) Implementation

Larry Matthews, U.S. Army
Carol Washington, U.S. Army
Greg Freeman, Professional Software Engineering, Inc.

Session Overview

Introduction

Larry Matthews of the U.S. Army Training Support Center provided information about how technology supports changes in the development and delivery of Army training. There is a new environment now, where the Army is expected to do more with fewer resources. The balance of responsibilities between the Active Army and the Reserve Component has shifted to more emphasis on the Reserves. Part of the strategy to address this challenge is a process called the Total Army Training System Course Analysis and Redesign Process, which converts many existing courses to distance learning formats.

Background

The Army's mission continues to evolve. Today the Army is charged with natural disaster relief support, humanitarian relief support, and a continued multi-regional conflict response capability. The number of military personnel has decreased from 725,000 in 1991 to 490,000 today. The Army's civilian personnel numbers have gone from 365,000 to 251,000 during the same period. Budget also has decreased by 30 percent. The Reserve Component is assuming more responsibility for duties previously undertaken by active duty soldiers. There are new jobs, new equipment, and new training requirements for both active and reserve forces. Consequently, new methods of training are required to maintain flexibility and readiness in this environment.

In addition, issues around which training needs to be conducted are more complex than in the past. Ten years ago Army personnel were learning fighting skills; today they must learn management strategies and containment techniques. But they also must be able to move out to meet orders. The basic training program, now eight weeks, will soon be expanded to nine weeks to address another Army training challenge—gender integration. The basic training curriculum has been expanded to allow more time for inculcating soldiers with basic Army values such as respect and emphasizing Army heritage and traditions.

The Total Army School System Partnership

The total force strategy the Army has now adopted means both active forces and the reserves must be trained to the same standard, even though reserve training time is limited. The Total Army School System (TASS) is a partnership among the Active Army, the Army Reserves, and the National Guard to promote the efficient use of facilities, equipment, personnel, and time, and

to standardize training. TASS is further complicated by the layers of training support that must be provided within the various branches: non-commissioned and commissioned officer training and brigade strategies, and service support training. The training mission is to establish consistency of the support provided, create operations efficiency, and support all the different constituencies with standardized training. TASS also is charged with supporting the training for new mission equipment. This provides occasions for training on equipment acquisition and equipment use.

A major initiative is distance learning, which the Army defines as the implementation of standardized training through the application of learning technologies. Distance learning may involve both synchronous and asynchronous student-instructor interaction. It may also involve self-paced instruction without benefit of access to an instructor. If an analysis of training determines that a technology will better accomplish the objective than instructor-delivered training, then that technology will be considered. The focus is on redesigning the curriculum to make it student centered. Effectiveness and outcome will be measured by whether the student can do a particular job to a particular standard under certain specified conditions. The student will only get credit for the training if this outcome is achieved.

The TATS Process

To address these challenges, the Army has adopted a Total Army Training System Course Analysis and Redesign (TATS) process. Training developers are assisted in redesigning courses for existing training products and materials to a single performance standard. The same standard is used for the various technological media. The process involves addressing the entire training continuum, identifying and aligning tasks and training requirements among the active forces and the reserves, leveraging existing training products, and providing a comprehensive, coherent blueprint for redesign. This facilitates the digitization of courses and the development of multimedia-based distance learning courseware.

Developers are trained in a series of three workshops. The first establishes the TATS baselines; the second derives learning objectives; and the third is an analysis of the media, method, and times of instruction, and a determination of the sequencing of the instruction.

Five phases help the staff prepare for the workshops:

- Initial coordination
- Determining critical tasks and supporting skills and knowledge
- Training and learning objective and analysis review
- The instructional redesign process and analysis of what is the best medium to use
- The documentation of the entire process.

Phase one. This includes an on-site coordinating meeting where training products are reviewed, and participants for the workshops are identified. It is important, when possible, that developers (or subject matter experts) be able to attend all three workshops.

Phase two. Prior to the workshops, task lines and matrices are prepared. At the first workshop, the critical task matrices for the new training products are identified and aligned with the active and reserve side of the training. Other critical tasks not in the baseline also are identified. Then a preliminary task analysis is conducted, and what should be kept and what should be cut are determined. Tasks are added if needed.

Phase three. Course learning objective matrices are prepared and the second workshop is facilitated. Each objective is reviewed in detail. Some need minor revision, others major revision. Some are no longer needed. Any new equipment needed is identified. The resulting documents are TATS Course Learning Objective Matrices.

Phase four. This refers to the instructional redesign that is done in the third workshop. Media and methods of instruction are chosen, and time of instruction and instructional sequencing are determined.

Phase five. Documentation for the redesigned course is created. A knowledge baseline for each course is provided, along with matrices for critical tasks, learning objectives, and a summary matrix of the redesign. The documentation includes a sequence of modules and lessons, testing requirements, critical tasks, and supporting skills and knowledge. It also identifies short- and long-term media delivery methods, and identifies whether these methods are appropriate for the active or reserve forces. A one-page pictorial course map shows the flow of the course from the beginning to end for both active and reserve forces.

How the Army Distance Learning Program Works

The Army Distance Learning Program establishes a two-phase, long-range program. First it digitizes existing courseware and centralizes storage. This conversion or development is for distance learning. Then it mandates acceptable media for conversion or courseware development, including print, platform or instructor-delivered, interactive multimedia instruction, and video teletraining.

Discussion

Input from Partners

A representative from the National Guard wondered how much input the Guard would have in the final phases of the conversion of training to distance learning formats. Mr. Matthews said such input is encouraged all the way through the process. If the Guard doesn't participate actively, TATS cannot be sure it is meeting Guard needs. TATS policy requires that the senior leadership at each level sign off on the project.

Lessons Learned

A representative from the EPA wanted to know how the process could be applied in other government organizations. Mr. Matthews replied that some lessons learned included—

- Revalidate mission and tasks for individuals who are being trained in specialized issues such as environment, medical, and transportation.
- Do a literature or inventory review to see what audiovisuals are available on the street, and at other agencies, and what other interactive products to leverage against the curriculum.
- Match these when appropriate to task level.
- Evaluate the strengths and weaknesses of the various media and how to apply them in specific circumstances.
- Don't divorce learning objectives from delivery strategy; make sure they mesh.
- Consider the target audience, the infrastructure to get to that audience, and its geographical dispersion. How do you structure interactivity for three different locations of 20 each, for example?
- Consider that most developers are subject matter experts but they might not have training technology strengths. We found, Mr. Matthews said, that in coming into an installation and working with the subject matter experts for a short period of time, it was possible to do the groundwork and then let the training developers make more effective decisions.

Demonstrations

The group was invited to view demonstrations of how the Army determines the appropriate media by using PCs that were stationed around the room. This included accessing a CD-ROM with information about what training medium has proven most effective under specific conditions.

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FAA Computer Based Instruction (CBI) Program

Jerry Sparks, Federal Aviation Administration

Session Overview

Introduction

This session described the Federal Aviation Administration's (FAA) Computer Based Instruction (CBI) System and presented the lessons learned in implementing this system. The FAA provides CBI to approximately 1,400 locations worldwide and utilizes 2,300 CBI platforms. The FAA provides not only the CBI, but also the equipment, maintenance of the equipment, a Wide Area Network (WAN), and Hotline assistance. Additionally, the FAA—

- Publishes courseware
- Trains programmers and contractors
- Collects training records for CBI both locally and centrally
- Provides overall program leadership and direction.

The Training Challenge

Geographical dispersion. The FAA has many different job specialties scattered all over the world; certification is required for many of these specialties. Key offices and functions include Air Traffic Control (ATC), Airway Facilities, Flight Inspection, Airports Planning, Aviation Security, Aircraft Certification, Flight Standards, Logistics, Human Resources, and Administration.

There are 23 ATC centers, which are clusters of many people. There are over 106 Flight Service Centers, 12 regional offices and centers, over 700 commercial airports, and approximately 2,000 locations that have navigational aids. Many of the navigational aid facilities are scattered on the top of mountains or in other remote locations. In addition, the FAA has 6 international offices. This wide geographical dispersion of offices and facilities presents a significant logistical challenge.

Traditional training approach. The traditional approach was resident training at either the FAA Academy in Oklahoma City or the Management School in Palm Coast, Florida. In 1991, the cost for moving and paying people, including travel and per diem costs, was nearly $50 million. In addition, considerable personnel time was consumed in traveling to and from training.

Diminishing training budget. Similar to many other government agencies, the FAA has seen budget decreases. For a while, the training demand was also going down, as the FAA was not hiring as many people. As air traffic controllers near retirement age, the need for training will once again begin to increase.

Background in distance learning. The FAA has had experience in distance learning for a long time, but in the broader definition. Training has been delivered by correspondence study since

1973, as well as with CBT from the early PLATO days. In 1993, the FAA introduced interactive video teletraining (IVT). As new technologies emerge, the FAA continues to try and stay on top of the curve, including the latest emphasis on Internet training.

The CBI Program

The Vision. The FAA standard is that CBI will be highly reliable, easy to use, delivered with state of the art technology, and available to all FAA employees.

The FAA makes many decisions based on the above standard. For example, if the system was not easy to use, a computer expert would be required in each field office. Since facilities are scattered all over the world, this would be a very costly endeavor. Additionally, if the system was unreliable, the students would complain, and in many instances this might involve union negotiations. Ideally, the technology should be easy to use and totally transparent to the student.

Hardware platform. One of things that makes FAA's CBI system so highly reliable is that the majority of systems were purchased at the same time, and the vendor was asked to provide spare parts simultaneously. The FAA has a unique situation: the 2,300 delivery systems consist of 1,600 of one configuration and 700 of another; all systems of each configuration are exactly alike. Purchasing spare parts at the same time avoids problems that can arise from differences between so-called "equivalent" parts. If a part fails in the CBI system, it is replaced with the "same" part and not an "equivalent" part.

At the time the systems were purchased, they were state of the art. Here is a sample configuration:

- 586 - 133 MHZ with 16M RAM
- 17" monitor
- Video disc with graphics overlay (non-interlaced)
- Audio Card
- 6X CD-ROM with caddies
- Dual hard drives (250MB each)

CBI locations. The FAA CBI delivery nearly covers the map of the United States, in all 50 states. There are many remote sites, such as Alaska. Some of the remote sites do not even have telephone coverage, and the FAA has to provide telephone service. The backbone is a Wide Area Network (WAN) with nodes or intersections at every ATC center. From the ATC site, lines branch out all over the countryside.

There are CBI platforms at all airport offices. The FAA has a high concentration of people at airport facilities, such as Flight Service Stations, Aircraft Certification, Security, and Towers. In many of these locations, there are single platforms, and the student data is stored on the platform. Other sites are connected via a LAN; from two to sixteen platforms may be connected together, and students can move from platform to platform and can access their records from any platform. One of the systems is configured as a server and the others as clients; the process is automatic, and a LAN manager is not required.

Computer Managed Instruction (CMI). One of the key tools in managing student information is the Computer Managed Instruction (CMI) System. The CMI keeps records of a student's activities. The FAA needs to maintain records, for each course offered, of who has completed the course, and who is certified. A site administrator, who can be a secretary or the student's manager, is assigned to manage the CMI; in most cases the latter is preferable, because this person can also help recommend courses for the individual employee.

Some of the functions of the site manager are—

- Add, delete, or edit a student's sign-on
- Enroll student(s) in course(s)
- Generate site reports
- Add site-specific courses to the local system
- Send messages to students
- Run automated system test(s)

Support in performing these functions is provided to the site administrator in the form of a site administrator's handbook, videotape, CMI online help, and hotline support.

Student records are uploaded to a central system. The records are sorted, summarized, loaded into reports, and given to the course managers; records are also placed into the personnel records of each student.

CBI Delivery

The process. Courseware is collected from various sources and put onto CD-ROMs and tested. Then multiple CD-ROMs are pressed for distribution to the field sites. This process costs the FAA about 79 cents per CD. The courseware runs from the CD-ROM. The only information that is written to the hard drive is the student's records, which are monitored by the CMI.

CBI utilization. Over 1,600 hours of CBI have been developed on CD-ROM for the various job functions within the FAA. In 1994, CBI utilization at the FAA was more than 220,000 student contact hours. Last November, the FAA shipped over 46,000 CD-ROMs. Currently 100 new courses are being published on CD-ROM. These new courses are state-of-the-art and look very different from their predecessors, written for PLATO. Present CBI platforms run both original PLATO and new Authorware courses.

Costs and Benefits of CBI

The cost for CBI delivery is approximately $1 per student hour; this compares with a cost of $24 per student hour for residential training. In fiscal year 1996, FAA CBI delivery resulted in a savings of more than $7 million.

Looking at the data another way, Mr. Sparks indicated that the FAA has been able to push development costs to as low as $5,000 per hour of CBI instruction (independent of number of

students). The break-even point comes at about 217 students, and in most cases this is well exceeded. If development goes to as high as $7,000 per hour, 304 students are needed to break even.

CBI Development

Currently, there are over 40 different course development activities at the FAA Academy, and there is site-specific development at about 52 air traffic sites. Courses are developed in-house by FAA staff or by contractors located at FAA facilities or contractor sites. Tools are provided by the FAA to all developers, including a developer's handbook, a developer's CD-ROM that has model templates and a graphics library, and a course on the FAA CBI lesson design.

The keys to the success of the FAA CBI program are "ease of use" and "reliable standards". Standard authoring standards are adhered to by all developers, including contractors. And of course, teamwork is critical for a good development staff.

Courses may also be acquired by cooperative agreements, or purchased off-the-shelf. Aircraft manufacturers (e.g., Boeing, Airbus) are interested in FAA inspectors being familiar with their aircraft. The FAA has received a course on the Boeing 777, developed by Boeing at a cost of about $30 million.

Course Designer. One of the useful development tools is Course Designer, which is owned by the FAA. Vendors who work with the FAA and the airlines can use this to build off-the-shelf CMI. The system concept is: Designer → File → CMI → Course Menus. Designer builds the files, which represent the logic for the course. The CMI uses the files to provide menus to students, collecting data and guiding the students through the course. The course is broken up into assignable units, small chunks of logic, and content for the course. Designer is used to organize lessons into courses with features including course design parameters, test weighting, lesson routing, review permissions, course delivery strategy, course activity outline, and testing strategy.

By using Designer, the FAA saves on maintenance and initial development, because it is not necessary to pay to recreate the logic. The structure of the material is—

Curriculum/String
Courses
Modules
Lessons
Topics, sections
Frames

Since Designer takes care of the logic and the CMI gathers the data, this allows the FAA to focus on content development. Thirty-minute modules are created, with tests interspersed. There is also a browse option built into the modules, so the student can view a course without tests, or review the course after completion.

Working with vendors. It is important to use experienced vendors and then to work very closely with the vendor. The FAA gives the vendors direction and requires them to adhere to the standards, which has helped to push down the prices for typical CBT development. Following along with the vendor through development ensures that there will be no surprises with the end product. There is growing competition in the field of CBT development. What has worked best for FAA is asking a number of experienced vendors to provide a firm, fixed-price quote on contracts.

The Role of Training in the FAA

Training is an integral component of system safety, security, human factors, system capacity, and global leadership, as identified in the *1996 FAA Strategic Plan*. The FAA is actively involved in the Aviation Industry CBI Committee (AICC) which sets *International Standards* for development and distribution of CBI course materials and management systems. The Canadian government is currently evaluating the FAA=s CBI training materials for inclusion in their training program.

Demonstration of Designer Courseware

After discussing the above topics, Mr. Sparks loaded Designer courseware from a CD-ROM for a demonstration. He showed how easy Designer is to use, both for instructors and students. Designer uses a standard Windows 95 format. The user can control the type of review allowed, and can enter a length of time for each activity in the lesson. By simply opening a course window, it is easy to see the various lessons and their relationships, which lessons build on each other, and which courses are optional. A score window can also be displayed, and weighting can be assigned to the scores. It is very easy to customize (build) a course at a specific site.

Discussion

Prerequisites or Other Changes

It is very easy to add special requirements to a course, e.g. prerequisites, or optional readings, etc. Mr. Sparks indicated that he was not aware of any limitations in the logic that would prevent changes, noting that at least in the past two years he has not experienced any restrictions.

Designer Courseware and the FAA

The FAA owns the Designer application. As the FAA moved away from mainframe delivery they needed a way to manage the students. Originally they identified a Macromedia tool that worked only on a Macintosh. The FAA bought the rights to use and modify the product. The FAA has recently made a deal with the Navy, which is currently moving to a Windows 95 environment, that helped pay for new changes. Such cooperative development efforts within the government can save money over the option of using an outside vendor to make the change.

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On-Line Learning: One Agency's Experience

Jim Buchanan, Federal Judicial Center
Bart Morrison, Federal Judicial Center
Dennise Orlando, Federal Judicial Center

Session Overview

Introduction

Mr. Buchanan asked attendees to introduce themselves and state their learning goal(s) for the session. Several participants took this opportunity to raise concerns about confidentiality and the potential legal ramifications of online conferencing. More than ten Federal agencies were represented, and experience with Web-based learning differed markedly. Mr. Buchanan explained that after he summarized the Federal Judicial Center (FJC) experience with online learning, his colleagues would describe specific courses and then all three presenters would share lessons learned.

FJC Experience

Courses offered by FJC facilitate the exchange of information among judicial centers located nationwide. Training is not mandated, and no certification or continuing credit is offered. For the past four years, the Center has used online conferencing for (1) skills training, (2) convening expert panels, (3) developing case studies for an on-going traditional course on conflict resolution, (4) sharing policies and procedures, which vary by jurisdiction, (5) discussing current issues or problems facing some or all of the judicial centers and brainstorming solutions, and (6) continuing discussions after a workshop ends.

How an Online Conference Works

Online conferencing can take place on the Internet or on an Intranet, such as the J-NET at the FJC. The Center uses Web Caucus software (produced by Screenporch, Inc.), which costs approximately $1,700, not including some relatively inexpensive add-ons. This software has a combed structure (architecture) that allows asynchronous communication. Trainees or participants are not physically in the same place, nor necessarily online, at the same time. Mr. Buchanan explained that the online conference organizer (moderator) assigns one topic (one discussion point) to each "item" in the structure. A conference may have as few or as many items as the instructional technologist, subject matter expert, and/or moderator deem necessary.

As preparation, trainees sometimes receive reading or research assignments before the Web conference begins. Participants access (log into) the conference whenever they wish, select one item from a menu of items, and read introductory notes from the moderator offering further information about the topic (item). Participants read through the "transcript" of previous comments from other participants and then "discuss" the item, if they wish, by typing in

responses. A blank response window appears at the end of the transcript for this purpose. All responses are inserted chronologically in a full-text screen format resembling a meeting transcript. Responses are numbered and show the date, time, and name of the participant. Every time participants check into a conference, the software informs them whether any new items have been added to the conference and whether any new responses have been typed in under a particular item since their last visit.

Mr. Buchanan stressed that the items are not chat rooms, because chat room discussions usually range freely across numerous topics. The online conferencing software structures the discussion topic by topic; each separate item represents a separate discussion topic. The moderator is responsible for "keeping order" and ensuring that participants stay on the topic. The number of responses is not limited by the software, but the moderator must ensure that the transcript is not so long that it becomes unwieldy. At intervals or when an item is closed or a conference ends, the moderator prints out the transcript, cleans it up, and distributes it to the participants. Moderators put out "flames" and serve as custodians, but they are not necessarily subject matter experts.

When Mr. Buchanan clarified that the FJC online conferencing software is text based with no video or audio capabilities, some attendees expressed surprise since they assumed that Web conferencing meant video conferencing. In response to the comment that Lotus Notes might be better suited to the task, he said that Web Caucus is easy to learn, is cheaper than Lotus Notes, and was available in 1993 when FJC started its online distance learning. He acknowledged that other software exists, and attendees suggested Microsoft Net Meeting, Powwow, Desktop Video Conferencing by Comflex, CUC Meet by White Pines, and Realaudio/Realvideo (free downloads). An attendee announced that a recent edition of *PC Magazine* featured groupware.

As an example, Mr. Buchanan showed the computer screens seen by participants in the FJC online negotiation training course. Trainees were divided into two groups, and each group received certain background information by mail. The online conference included separate items on negotiation skills, general strategies, case studies, and other resources. One item was dedicated to each group's preparation of its respective strategy. He showed the screen printout for the group assigned to prepare the negotiating strategy for a car owner involved in a garage dispute. After the strategy discussion, the trainees were asked to choose one member to play the part of the car owner and negotiate online.

An Online Newsletter Planning and Writing Workshop

Mr. Morrison urged attendees not to shy away from skills-based training using online conferencing, as he introduced a discussion of an FJC workshop on newsletter planning and writing that was delivered online. He noted that the technology chosen by any agency must support the majority of its training efforts. Web Caucus works well for the FJC and judicial centers around the country because it supports HTML and Shockwave.

For the FJC online workshop on newsletter planning and writing, an experienced newsletter editor was hired to determine the overall instructional design of the tutorial using diverse learning methods, including print materials. The online course uses Adobe Acrobat .pdf files, HTML for

the Participant's Guide (main menu) and six content modules, and Web Caucus conferencing software to discuss assignments. Designers used the Shockwave plug-in with Netscape to create drag and drop text entries.

Trainees navigate between the Web-based tutorials (modules) and the online conference. They can link to Web pages for additional information/resources and upload to the conference area any files that the Web browser supports. As many as 40 students have participated in this workshop, receiving individualized mentoring from the expert moderator on each assignment. After completing the tutorials and assignments, trainees performed by writing a feature article that was uploaded to the Web conference and critiqued by the moderator and other trainees.

To help build a group dynamic, the workshop moderator invited all participants to submit a photo and short bio, which were posted online. The moderator also provided opportunities for the group to "meet" via audio or video before the Web-based workshop began. Mr. Morrison emphasized the importance of giving participants a few days to experiment and grow comfortable with any online system. In his experience, trainees also find an online help desk useful.

An Online Conference on Street Gangs

Ms. Orlando described how Web conferencing was used during a multiphase training program to help Federal probation officers better investigate and supervise street gang members. The training program began with a printed offender profile that was mailed to 4,000 officers, followed by a Web conference attended by 98 officers. The Web conference, designed as a system-wide town meeting, was followed by a satellite broadcast with a panel of experts. The program concluded with a summary report.

The Web conference lasted five weeks. The first week oriented the trainees to the online environment. As moderator, Ms. Orlando created an item for introductions (name, district, goal), an item for participants' questions and tips regarding the use of online conferencing, an item showing the conference agenda or plan, and an item entitled "water cooler" where participants could comment on anything. Participants did, in fact, practice navigating through the conferencing options and responding during the orientation week.

The online conference on gangs had 20 discussion topics (items), including the orientation items mentioned above. The four weeks devoted to the conference proper covered the extent of the gang problem, major issues, and strategies/resources for addressing the issues. Once the main conference begins, Ms. Orlando recommends having only one or two discussion items open at a time. As moderator, she set the parameters, opened new items per the posted agenda, and notified participants that other items would be closing. Once an item closed, participants could review the transcript but could not add responses. From experience, she and Mr. Buchanan both recommended limiting the response time for a new discussion item to three days.

As moderator, she encouraged and reinforced participation by giving a "virtual" nod to participants—typing in "That's a good point!" for example. She skimmed the responses, watched the ebb and flow of the "discussion," asked probing questions, offered encouragement by name to

one person or several people with good ideas, and redirected the conversation, if necessary. Before closing an item, she summarized the discussion, often as a bulleted list of key points.

Discussion

The Role of the Moderator

In response to several questions, Ms. Orlando elaborated on the role of the moderator. It is crucial for the moderator to refocus the discussion when participants go off on tangents. In some instances, she has cut responses from one item and pasted them in a more appropriate item to keep the discussion on track. She believes that online conference moderators use the same skills as good classroom instructors, such as encouraging, questioning, redirecting, and focusing the participants.

She noted that moderators can track students who have not yet logged on and monitor students who have logged on but who are just reading the transcripts (also called "lurking") and not responding. During the first week, she usually telephones those who have not logged on, to inquire politely about any problems they may be encountering. Mr. Morrison added that readers (or lurkers) will absorb and process the information provided. To justify the return on investment, however, an agency may want to know exactly how many readers took part in any given online conference. Mr. Buchanan argued that when "readers" do not participate, this does not mean they are not learning.

Participant Commitment

Referring to earlier comments by his colleagues, Mr. Morrison said that because the FJC courses are not mandatory, all the online courses must be designed to attract and keep participants. The training must be useful and interesting so that staff members are motivated to fit the online courses into their busy schedules. He added that prior to each conference, FJC moderators send the participants' supervisors a letter emphasizing the training aspect and explaining that their staff members will need 15 to 30 minutes a day during the coming three to four weeks to participate in a meaningful way. This is the outside amount of time a participant will spend. It also depends on how big the conference is; the larger the conference, the more time will be spent keeping up with the "discussion." Mr. Buchanan noted that online conferencing has allowed FJC instructors to compress residential training because work can be done online before or after the residential course. Managers and staff members appreciate shorter residential training sessions.

Conference Duration

Mr. Buchanan noted that in the early days the FJC online conferences lasted three months, but that was too long. Now, they last no more than one month, and participants are encouraged to respond to discussion items at least three times per week. Both he and Ms. Orlando said that, from experience, 40 participants are manageable, with 60 being the maximum.

Advantages of Text-Based Discussions

Several attendees asked Mr. Buchanan to elaborate on the advantages of text-based discussions compared with audio/video conferencing. In his experience, the benefit of using text is that it slows down the discussion/argument. People take time to read and digest others' ideas before responding themselves. With a written record of the discussion, participants can go back, reread their own arguments, and change their positions. Facts written down can be checked. Also, in a live discussion some people are cowed by dominant personalities. This occurs less often in an online conference where discussions are written down and the audio and visual clues that often reinforce dominant personalities are missing.

When an attendee suggested that E-mail works the same way, Mr. Buchanan replied that the structure of Web conferencing is more elegant. It separates topics so that the discussion can be managed. It also creates a record of the discussion. He encourages E-mail between two trainees for private or confidential comments.

Online Decision Making

An attendee raised concerns about making agency decisions online during a conference. Mr. Buchanan stated that the FJC promotes ideas and shares examples, which other courts can apply if and when possible. Policy decisions are not made during the conferences. Following up, the attendee asked about the possibility of the written transcript being misconstrued as real policy. Mr. Buchanan replied that policy is normally formulated via discussion, which Web conferencing can facilitate. Certifying policy is generally done in real time at a face-to-face meeting. If confidentiality is an issue, the conferees can be given a password to limit who views the transcript.

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Training at a Distance: Merging Technologies for Creative Learning

Adele Suchinsky Ewing, U.S. General Accounting Office

Session Overview

This session focused on the process involved in choosing a distance learning mode in an environment where technologies are merging into different formats. It provided an overview of both current and emerging technologies for distance learning, and described the different technologies in use by the General Accounting Office (GAO), as well as the challenges the agency faced in the implementation of those technologies.

One of the interesting things about distance learning, Ms. Ewing noted, is taking what has been previously delivered in a classroom setting, and adapting that content to such media as video conferencing.

Distance Learning Delivery Options

The term "distance learning" has different interpretations: it can characterize training with the physical presence of an instructor, or it can refer to training that is widely and broadly distributed, without an instructor at all. The attendees mentioned some distance learning delivery options, including satellite downlink systems, the Internet, fiber-optic communication systems, audio conferencing, Web-based training, and video conferencing. Noting that there is no standard terminology regarding these delivery formats, Ms. Ewing focused on four specific options:

- *Self-paced training.* This can mean software packages, loaded onto a computer, that students can negotiate at their own pace; self-paced training can also include correspondence courses. Computer based training (CBT) can be done in several different formats: multimedia, CD-ROM, straight CBT, Web-based, or some combination of these. Where the self-paced training occurs, and how the training is distributed, is not always the same.
- *Video teletraining.* This means different things to different agencies as well: it can refer to one-way video/two-way audio that is satellite-based; or it can mean two-way audio and video that is terrestrial-based. At the GAO, Ms. Ewing noted, "video teletraining" refers to two-way video and audio.
- *Instructional television.* At the GAO, Ms Ewing continued, one-way video and two-way audio is characterized as "instructional television".
- *Live, online learning.* This is another medium used by GAO in its training, Ms. Ewing said. This is training on a computer, which could involve the Internet, the Intranet, or the network. The advantages of this training medium are that it is quick and inexpensive to deliver. There are two ways of putting a live class on the network or the Internet. One is asynchronous computer learning, where all students take the same course, do the same work, and interact with each other as well as with the online instructor, but not at the same time. The other is synchronous computer

learning. This takes the form of chat rooms. GAO does not have this technology yet.

Ms. Ewing cited and recommended a book on this subject, by Zane Berge at the University of Maryland at Baltimore County, called *Computer-Mediated Communications*.

Other distance learning terminology. In academia, Internet-based training, or online training, usually involves an instructor placing course content on the Internet via E-mail; there is demonstrably more of an interactive component to it. In universities, therefore, Internet-based training is not necessarily synonymous with computer based training on the Internet; the class is conducted interactively via electronic mail.

Desktop learning, Ms. Ewing continued, can use CD-ROM, and video to the desk is a technology that is forthcoming. Networks allow downloading of large training software packages. The "desktop" however, is only the place where such training is accessed; it is not necessarily the delivery format.

Video-based training includes satellite conferencing, downlinks, cable television, and the ever-popular videotapes.

Factors for Making Selections

Ms. Ewing canvassed the attendees on which factors impacted their choices among technologies. Factors identified included—

- Cost
- Geographic separation among the branches of an organization
- Compatibility among computer languages
- Inherited technologies.

Commenting on inherited technologies, Ms. Ewing observed that GAO used video teletraining because the Agency had purchased a video conferencing system for the entire organization. An attendee noted that a pre-existing technology at one end does not necessarily ordain a solution; there has to be a compatible technology at the other end, and development of a distance learning format needs to consider this. With a lot of Federal agencies, he added, there is often no coordination in technology procurement among branches. With the GAO, Ms. Ewing replied, the procurement was not such a piecemeal effort; the agency created an organization-wide plan.

Redesigning Instructional Strategies

No matter which format is used, Ms. Ewing observed, a classroom-based design cannot be simply inserted into another medium. The key question is whether reluctance to adopt new technologies is legitimate or not—an issue that course designers and trainers usually have to wrestle with. When redesigning instructional strategies, the attendees mentioned these as relevant questions to ask:

- Can the course fit into a different format?

- What are the technologies to choose from?
- What is the course objective?
- How much development time is available for the new format? There are course development deadlines that may preclude using certain technologies.
- What is the level of in-house expertise with the particular technology?

In course development and conversion, Ms. Ewing advised, one of the best things to do is observe how the course is taught and note which of the interactions taking place (whether between instructor and student or among students) are vital to the success of that course.

Exercise with pennies. As an illustration of the challenges involved in redesigning instructional strategies, Ms. Ewing conducted a problem-solving activity, presenting groups of attendees with 10 pennies and asking them to arrange them in two rows of six. Each team had an observer; the exercise demanded the groups think creatively. Ms. Ewing then asked the observers if they had any format in mind while watching this exercise; she then asked how this activity could be redesigned to fit a two-way videoconferencing format, in order to obtain a higher degree of participation and success among the participants. Some of the suggestions were—

- Expand upon the written instructions; it could be either a group or independent activity, even with pure text.
- Alternatively, provide some sort of visual of the pennies, using either one-way or two-way video.

One of the problems in converting a traditional classroom exercise (such as this one) to a videoconferencing format, Ms. Ewing observed, is that some may feel that the videoconferencing format does not accommodate splitting the class into groups. To alleviate this concern, she suggested closely analyzing the activity and then defining what aspects of the activity would have to change when converting it.

There are those exercises that cannot be converted, she continued. In that situation, she suggested creating a new exercise that is easier to convert to the desired format; the purpose, she stressed, is not in the instructional strategy, but in meeting the lesson's objectives.

When redesigning strategies, she observed—

- If adapting content to video, pay more attention to what the students need to hear.
- If adapting content to live, online learning, pay close attention to what the students read; instructions, after all, are the surrogate for the physical presence of the instructor.
- In video teletraining or videoconferencing, unlike in the classroom setting, the sites can be muted, helping the student or group do the activity without distractions.

GAO's Experiences with Distance Learning

Over the past eight years, Ms. Ewing continued, the GAO has experimented with four different forms of distance learning technologies—experience that includes merging some of them. She reviewed her agency's efforts with each type.

Self-paced instruction. GAO established learning centers with two different programs; in creating these, it became apparent that people were reluctant to physically travel to the learning center site. At the same time, there were programs that could only be delivered in a learning center environment; the Agency could not give its employees interactive videodisc systems to take home, partially due to the costs of some of these packages. There were also courses that did not have to be delivered in a specific facility. As a response, GAO created a **learning center** for training that had to be delivered in-house, and a separate **distributed training program** for training that could be sent out to the users. For the learning centers to work, it was critical to have skilled administrators, an appropriate physical space and environment for the students to work in, and ample materials.

Perhaps the most important thing for any agency to do, Ms. Ewing stressed, is to maximize resources by establishing what aspects of the course are generic and what aspects are agency-specific. Generic course aspects can then be developed or purchased in conjunction with other agencies and delivered through CBT, in a self-paced kind of program, affording individual students all the time they need to master that material. The classroom training can then focus on agency-specific course content.

Instructional television/video teletraining. Ms. Ewing showed a video clip of an instructor using a one-way video satellite broadcast medium for the first time. The instructor, she observed, quickly picked up on how to interact with the students through this medium, which is generally considered to be detrimental to creating an interactive environment. The instructor helped facilitate an interactive sense, however, by preparing a list of sites she was broadcasting to, which she could refer to and call on individually while conducting the lesson.

Commonly, instructors need to learn these methods "by doing;" there is often no time to offer formal instruction on them. Alternatively, it does the students a disservice if the instructor is not familiar with the specific requirements of these methods. The use of graphics with these methods presents a redesign issue; and needless pacing by the instructor is much more of a distraction to a student watching a broadcast than it would be in a classroom setting.

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Live, online learning. For the past year and a half, Ms. Ewing continued, live, online learning has been used by GAO in two different formats; a third is shortly to begin. Initially, the agency experimented with a Writing Seminar course; this seemed a natural fit with an online program. At the same time, the agency had just developed a new document management system, which it was anxious to teach to its staff. The classroom version of the course was placed online, with a minimum of redesign. Unfortunately, people had trouble trying to access the system; as a result, the Writing Seminar course became the tool for learning the system, instead of the system being the tool to deliver the course.

The instructors did like this delivery method; although they spent more time online than they did lecturing in class, they could review a student's work, item by item. The first attempt at a Writing Seminar module used a very formal tone when addressing the students.

In another effort, GAO revised a course on giving Better Briefings, and then put it online in a live, asychronous format. Due to the nature of the course, it could not be placed online in its entirety. The first few hours of the course, however, addressed preparing for a briefing, which could be placed online and worked on away from the classroom. This approach expanded the class, and gave the students more time and attention; consequently, the students were better prepared when they finally gave their briefings. The conversion of the first five hours of the course to an online self-paced format required little development time and cost; the second half of the class—giving the presentation—was converted to a video teletraining format. In the revision of this course, its tone was changed to make it more informal and conversational. This combined delivery met with great success.

Design considerations. Ms. Ewing then listed some of the lessons that have been learned from GAO efforts to deliver training live, online:

- The training should be more participatory; students should be encouraged to communicate with the instructors, as well as their fellow classmates.
- Emphasizing the printed word means the instructions have to be phrased more carefully.
- There should be a tone change from the formal to the informal in communicating with the students; this allows the instructor to be more of a facilitator, and less of a teacher.
- Connecting the students with resources and assignments is often done through attachments that are sent out on regularly scheduled dates.

Interagency Distance Education Advocates (IDEA)

Ms. Ewing closed by discussing this six-month-old working group, consisting only of government personnel, that meets online to discuss distance education issues in the government. Meetings so far have discussed a variety of topics, including instructional design. They meet as often as possible; there are 14 members currently and IDEA is open to new members. The concept is to replace the former Interagency Group for Interactive Training Technology (IGITT), which no longer meets. IDEA intends to meet online on a regular basis, share information, and answer questions. Other government organizations represented include the Federal Emergency Management Agency (FEMA) and the National Institutes of Health (NIH). She invited the attendees to join via E-mail.

Those interested in joining IDEA should send an E-mail to Ms. Ewing including name, title, mailing and E-mailing addresses, phone and fax numbers, and a description of their training efforts using technology; members should be willing to participate in the online discussions.

Credit/Additional Resource

The activity Ms. Ewing used was courtesy of Janet Bernhards, Consultant, Video Training, 703-354-6914.

The book, *Video Teletraining: A Guide to Design, Development, and Use*, written by Ms. Ewing and Ms. Bernhards and published by the GAO Training Institute, is available from *www.gao.gov/special.pubs/ti95001.pdf*

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Delivering Education to the Desktop

Irene Sanchez, Internal Revenue Service
Mitch Chazan, Internal Revenue Service

Session Overview

This session was designed to inform attendees about how distance learning is used to deliver desktop training to employees in the Internal Revenue Service (IRS). In the face of declining budgets, rapidly changing environments, and new government requirements to consolidate resources and efforts, the IRS is training its workforce through many different forms of distance learning. IRS Corporate Education oversees three "Schools;" they are Taxation, Professional Development, and Information Technology.

Education Delivery at the IRS

The Corporate Education group at IRS was created in 1994 to meet the challenges posed by smaller budgets, the need to rapidly re-skill employees, and rapid technological change. Before Corporate Education existed, the IRS workforce was geographically dispersed; the working environment was relatively stable; 80 to 90 percent of training was conducted in classrooms; on-the-job training, computer based training (CBT), and independent study accounted for 10 to 20 percent of the training; and the budget was declining yearly.

Distance learning has been in use at the IRS since 1987. One goal of the distance learning program was to deliver personalized training to learners in remote locations, using existing platforms and technologies. Another goal was to put in place a simple acquisition process to procure off-the-shelf products to enable the IRS to keep up with changing technology. To deliver education and training to large numbers of people spread across the country and around the world, the Internet is accessed through the existing T1 network infrastructure. Delivery strategies include live conferences delivered to desktops, a Web site offering access to frequently asked questions and answers, a secure Intranet, CBT, video segments archived or distributed online, and a lab to allow employees to practice skills in real situations and scenarios.

The old "Coaching Center" concept. Previously, the IRS used a "Coaching Center" approach to information systems training. The Coaching Center was staffed by information systems personnel including computer specialists and LAN administrators, and was oriented towards information systems topics with very limited audiences. When students were enrolled, they were assigned to a coach. The coach developed a training plan, using input from the employee's manager, and sent the plan to the student. The coach administered tests online and provided feedback to the student and manager. Eventually, the audience shrank as the limited student population had all been trained and there was no mandate to develop any new courses.

The IITI. The old "Coaching Center" at the IRS has been replaced by the "Individual Information Technology Institute" (IITI). The IITI's mission is to—

- Provide leadership in assessing the impact of emerging technology on the Service's workforce
- Prepare employees to meet technology-driven changes in skills
- Utilize available technology to provide multiple means of learning for a diverse student population
- Provide just-in-time, cost effective, quality-driven training to meet needs identified by corporate stakeholders, first-line managers, and employees.

The IITI's perspective is to—

- Stay abreast of emerging/changing technology
- Acquire new courses
- Continuously research training needs and evaluate learning effectiveness
- Accomplish its work through its performance consulting teams
- Beta test new technology
- Establish relationships with industry, universities, and other government agencies
- Apply technology to delivery methods
- Become leaders in applying technology to education.

Now, the curriculum has been greatly expanded; the audience has grown tremendously; partnerships have been formed with other agencies and companies to create beta test sites to test new education and training products; and individual competencies and training needs have been identified and are addressed through the use of modularized courses and the provision of just-in-time, individualized access to training.

IITI is creating new training methods that are proactive, customer focused, effective, timely, affordable, and reliable.

Choosing an Integrated Learning Environment

Needs of today's IRS. The IRS needed a single delivery vehicle for multiple means of communication; one that is effective, service-wide, timely, broadly available to anyone at anytime, and that delivers a consistent message. It also needed to develop new courseware on topics including information systems, human resources, EEO, computer literacy, management, and network administration. And, it needed to collaborate with the traditional information systems (IS) training community, other IRS functions, external agencies, and other organizations.

Evaluating alternative technologies. Using a software package called *Advisor*, the IRS evaluated and compared the cost-effectiveness of various delivery methods including CD-ROM, videotape, satellite TV, and instructor-led classroom courses, and Intranet/Internet-based delivery methods.

CD-ROM and videotape were neither real-time nor always available "just-in-time," and it was more difficult to verify use and to pre- and post-test. Though real-time, satellite TV was expensive and required participants to be at downlink sites. Instructor-led classroom courses were not cost-effective, "just-in-time," or time efficient; they didn't deliver consistent messages; and they were limited in reach.

The Intranet delivery model was judged the best alternative to meet all IRS criteria; it provides competency-based, student-centered, cost-effective, "just-in-time" learning that is high-quality, reproducible, and consistent. The Intranet delivery model is standards-based and thus reproducible. It allows rapid development of new courseware. It is bandwidth-friendly; each employee can receive high quality video that uses less than 1/3 of the T1 line. New compression techniques will use less than 1/16 of the T1. And, the Intranet allows quick and easy multi-level feedback; students, managers, and peers can complete questionnaires by telephone dial-in.

Through the Intranet, training is delivered using CBT, electronic text, coached study, live or pre-recorded video delivered at the desktop, and videoconferencing. New methods available with the use of browsers include online labs, chat sessions, news groups, and E-mail. All of these methods deliver help to users when they need it.

Tradeoffs of alternative methods. For all the positives associated with the Intranet delivery model, other approaches have their benefits and drawbacks:

- *Coached self study*. This option provides individual expertise, content expertise, individualized training plans, and individualized test review and analysis.
- *CBT*. CBT material is interactive and can include multimedia (audio and video). CBT can be made available on CD-ROM or can be easily down-loaded from the Web; Web-delivered CBT is also becoming a reality.
- *Video conferencing*. This approach allows two-way communication and accommodates small groups; it requires high bandwidth (one plus streams per user); and requires cameras, microphones, and capture cards at each desktop.
- *Video on demand.* This is one-way, point-to-point (pull model); it requires moderate to high bandwidth (one stream per user); and can require network upgrades and expensive video server equipment.
- *Broadcast video (live or NVOD).* This is one-way, one-to-many (push model); it requires low bandwidth (one stream for unlimited users-multicast); and costs for software are low.

Lessons Learned

Diverse infrastructure problems. The infrastructure is much more diverse than was expected in terms of data communications, hardware, software, user intensity, and competition among users for use of the T1 line.

- *Data communications.* Many places are not on the T1; some use modems and PPP connections; others have no network connectivity.
- *Hardware*. Hardware varies from Pentium technology on down. There are still some 286s without CD-ROMs.

- *Software*. Platforms vary from NT, Windows 95, Windows 3.1, to DOS and Mac.
- *User intensity*. Some users are very casual, intermittent browsers; others are power users.
- *Competition for use of the T1*. Training users compete against each other for the use of the T1 for tax processing training, technical and organizational process training, and career development uses. Business communications users compete for the use of the T1 for agency announcements/news, management presentations, meetings, and emergency broadcasts. Decisions must take all the competing needs into account. For example, it may be necessary to choose whether to use high-quality MPEG video and tie up the T1, or to use another lower-quality format that does not use all of theT1 capacity.

Other requirements. User computer literacy deficiencies, requirements for reasonable accommodation of disabilities, and browser restrictions or firewalls are potential challenges that must be actively addressed in the implementation. Lack of technology in the budgeted training dollars is another concern to be addressed.

Infrastructure solutions. As a result of the problems caused by the diverse infrastructure, Corporate Education realized minimum hardware and software standards needed to be set. Current standards for the host system are—

- Windows NT 4.0 as the operating system for all servers
- Internet Explorer 3.2 or later as the browser
- IIS 4.0 as the Web server (chosen for its new features such as newsgroups and E-mail, which are no longer add-ons)
- Precept IP-TV as the multicast video streaming product
- CD towers as repositories for the huge amounts of data.

Since absolute standards are unrealistic for desktops in the field, a "layered" approach based on intensity of use and site requirements was implemented. In some areas, depending on numbers of users and priority of training needs, users have their own or have access to multimedia-capable, Pentium machines now running on Windows 95 or NT 4.0, with Internet Explorer 3.0 or later (or Netscape 3.0 or later), and standardized software suites such as Microsoft Office. For employees who do not have access to high-end, Intranet-capable machines, alternatives are made available at Professional Development Centers (PDC). These Centers, located in various sites across the country, are equipped with high-end machines and are available for use by any IRS employee who does not have a workstation equipped for Intranet training. But, since not every state has a PDC yet, it may not be cost-effective to travel to a PDC site. Sometimes it is more cost-effective to send the user to local, outsourced training, or to mail training materials such as CD-ROMs, diskettes, videotapes, or text-based materials to students.

Reasonable accommodation solutions. New Windows-based hardware and software tools that provide needed accommodations are now in use at the IRS. Examples include—

- Braille keyboards called *PowerBraille* with refreshable Braille displays that use specialized software such as *Screen Power for Windows* (SPWIN) and *Job Access With Speech* (JAWS); and speech synthesis hardware called *DECTALK*

- Accessibility features built in to Windows 95 and Windows NT 4.0 (to be greatly enhanced in NT 5.0)
- Large screen package of software and hardware called *VISTA*
- *Braille and Speak* device that allows user to type in Braille text to the device, transfer files to or from a PC, or synthesize the text into speech.

Keys to Success

From the perspective of the Corporate Education staff, the success of its Intranet delivery model rests on an enhanced and fully operational information delivery system, with four key components:

- Automated and centralized course administration (on-line course registration/ scheduling/tracking)
- Centralized storage and availability on the Intranet of all IRS training materials in any format
- A Web site that can accommodate "Web-enabled" CBT, and that can provide access to electronic text, on-line help direct from vendors and software companies, frequently asked questions, chat rooms, news groups, and video conferencing
- Broadcast video that is multicast, delivered to individual desktops on demand over low-speed (56K) network connections to augment satellite/closed circuit networks.

Outstanding Issues

Volume of data. Questions remain concerning backup of hard drives: should CD-ROMs be used, or mirrored systems? Also, there is a critical need to plan for the resumption of business, should the worst case system failure occur.

Intranet access. Current IRS policy limits access to the Intranet; no access is allowed from home, on travel, or from another agency.

Other issues. Currently, the Bureau of Alcohol, Tobacco, and Firearms (ATF), Customs, and the rest of the Department of the Treasury cannot communicate with each other. Nor is there access to the Department of Defense (DoD), even through IRS and DoD have formed strong partnerships. Links need to be formed with universities and companies that have distance learning programs, and there should be cooperative course development with other agencies.

Looking ahead. The IRS is investigating the use of DVD, NT– thin client, Microsoft NT Hydra, and wireless Intranets.

Discussion

Management Support of Desktop Training

An attendee asked how to convince managers to release employees for training time at their own computers. Attendees were advised to help the managers focus on the decreased amount of time

needed for “precision training” at employees’ desktops (e.g., no travel time; smaller increments of training being accessed faster, etc.). It was also pointed out that IRS managers are used to the “coaching center” concept; they are accustomed to having to make time to release their employees for training.

Computer Literacy

An attendee asked if the IRS is still teaching computer literacy. Most of these courses are off-the-shelf packages. For IRS staff, a list of courses is available by E-mail or can be viewed on the Web site. A catalog can be mailed to anyone else.

ADSL

An attendee asked if ADSL will require hardware changes. ADSL is just an interface that requires no change in hardware. ADSL would only be used for remote access to the Intranet.

ACES

An attendee asked if the ACES system can be used for online testing. ACES is just an online administration program.

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Matching the Learner's Business Environment Using Technology: Successfully Converting Traditional Training to an Online and Teletraining Delivery at GAO

Jo Longnecker, U.S. General Accounting Office

Session Overview

This presentation was designed to help trainers and instructors recognize components of traditional classroom courses that adapt easily to interactive, non-traditional training programs. Ms. Longnecker also discussed ways to transition learners and instructors to the new technology. By looking at the challenges faced each step of the way, she took participants through the lessons she has learned from her own experiences. From learners with low-level or no computer experience to trainers resistant to change, she discussed methods to overcome the obstacles inherent in introducing a new computer based training program.

Background

The lessons learned are from Ms. Longnecker's conversion of two modules of the GAO *Better Briefings* training course to online delivery via cc:Mail and teletraining format. In the traditional course, there was no time to help the participants prepare their briefings. The modified course combines three online instructional programs that help the learners develop and prepare an effective briefing before the presentation portion of the course begins. The presentation portion takes place in a classroom or videoconference, during which students learn delivery tips, how to create and present visuals, and how to make effective use of the video camera and display technology, using the graphics tablet and TV monitor. At the end of the course, learners present their briefings and are critiqued by the other participants.

The modified course provides the added benefits of helping learners write and prepare their briefing over a period of time. By keeping the presentation portion of the course, students continue to receive "live" information and practice in real-life situations.

Ms. Longnecker accomplished the online conversion using cc:Mail on a minimal budget.

Converting to Online Delivery

Lectures, exercises, self-assessments, and discussions were identified by Ms. Longnecker as appropriate modules for online delivery. As part of the conversion, the instructions and background information were rewritten in an informal and friendly tone. The abbreviated lessons were prepared in a WordPerfect format and then cut and pasted into cc:Mail messages. The goal was to create an atmosphere that generated interest and made participants want to come together.

To distinguish the course content and discussion from other cc:Mail messages, the course content was put in yellow type. Headers and highlighted materials were put in green or blue type. Colors were used to emphasize instructions and important points. Learners were instructed to color their messages as well, to provide recognition.

Getting Learner Buy-In

Acknowledging the potential reluctance of learners to transition to an online course, Ms. Longnecker stressed the need to build an architecture that explains up front the expectations and steps needed to complete the requirements. Learners receive a cc:Mail message three weeks prior to the start of the course that tells them the time frame, contacts for more information, and expectations. The number of lessons, the time provided for the completion of each lesson, and the approximate amount of time that each lesson will require are also included in the first cc:Mail message.

The initial cc:Mail message was modeled on the actual course messages. The same format is used. The tone is friendly and conversational. Instructions are specific. For example, learners are told each step required to respond to the cc:Mail message—the icons to click on, how to change the color of the type—as well as when a response is required. Ms. Longnecker discussed the need to accommodate all computer skill levels in order to create a comfortable atmosphere in which each learner feels he or she can participate.

Transitioning to the Online Format

Just as a classroom course begins with learners getting acquainted, Ms. Longnecker built a similar exercise into the online modules. Learners are provided with the names and E-mail addresses of all course participants. Through cc:Mail messages, the conventions of interaction are defined and learners are familiarized with the technology. Learners are encouraged to send their questions and comments to everyone. When a question is received by the trainer, only after asking permission, the trainer sends the question and response to everyone for online discussion.

The trainer typically sent the cc:Mail message the evening before so it was waiting when learners arrived at work the next morning. Ms. Longnecker noted that the first day she spent a couple of hours responding to messages. She recommended that trainers respond to learners' messages within two to three hours.

Gaining Interaction Online

By design, the cc:Mail course provides group discussions as well as one-on-one interaction between the learner and instructor. By providing time lines for the completion of the work and responding within consistent time frames to learners' messages, Ms. Longnecker reported, learners become more comfortable with the course. They also learn that they can be flexible about when they perform the exercises. Some have come in before work hours knowing that the material would be waiting for them. Others have worked in the evening, knowing that they could send a cc:Mail message so that the trainer would have it in the morning.

To promote interaction, Ms. Longnecker included questions in the online material. The questions required that the learners respond and interact with one another.

Ms. Longnecker answered the challenge of the variation in employee technical skill levels by providing specific instructions for each step in the online process. The learners are told how to access the first attachment, how to close it, and then how to get back to the original message. For one learner, instructions were provided to print the attachment from cc:Mail. The instructions removed some of the anxiety for less technically skilled learners, she explained.

Training the Trainer

Trainers are often the hardest to train, said Ms. Longnecker, noting their resistance to change. Acknowledging that most trainers enjoy contact with participants, she said that getting trainers to understand that they will have one-on-one contact with the learners and opportunities for coaching helps them buy in to the new format.

Bringing the Trainer Online

All the cc:Mail messages were created in advance and provided to the trainer along with a time line. A supplemental guide was produced that responded to the trainers' questions. The information is specific: when to send a message, how quickly to respond, the colors to use, the desired tone and words to use, etc.

Ms. Longnecker sits with each trainer the first time he or she teaches the course to make sure the messages are sent at the appropriate time, to help with technical issues, and to coach the trainer in his or her responses. She archives the questions from each course so the trainers can practice their responses.

Transitioning to the Teletraining Format

The second half of the *Better Briefings* course provides the learners with tips for improving visual aids and graphics, rehearsal time for their presentations, and a critique of their final presentations. Use of videoconferencing for this portion of the course replicates how learners present many of their briefings in their daily work. The course concentrates on tips that help the learners use the technology effectively, as well as on body language, appearance, briefing content, and presentation structure.

This portion of the course begins with an icebreaker. The participants already know one another through online discussions. Now that they can see one another, exercises that reintroduce them are used. Learning and interacting with their peers is stressed through critiques and information sharing.

Ms. Longnecker also works in advance with the videoconferencing trainers. The trainer's supplemental guide includes specific information including how long to concentrate on each topic

and the visual aids that are to be used for each discussion. She noted that many trainers do not feel comfortable seeing themselves on the TV monitor while they are training. GAO has set up the auxiliary cameras in their videoconferencing rooms so that the trainer cannot see the television on which he or she appears.

Trainers are also paired with production assistants who control the cameras and video tools such as the graphics tablet. Trainers and production assistants are encouraged to practice before each session.

Ms. Longnecker cautioned that, for this course, GAO does not put any learners in the same room with the trainer. The trainer must focus on the distant learners, she said, which makes the in-room learners feel left out. Only the trainer and production assistant are in the room.

Rewards Using Technology

Ms. Longnecker cited the following as rewards achieved by the restructured online and teletraining course:

- Learner-specific coaching
- Learning from peers
- Flexible time frames for online sessions
- Convenient desktop location
- Low-cost implementation.

Discussion

Learner Requirements

In response to questions, Ms. Longnecker stated that the course did not impose a lot of requirements on the learners. For example, there was no requirement that the course participants print the cc:Mail lessons. They did not have to work for a specific number of hours at a time. These were decisions that she felt are the responsibility of the adult learners.

If learners knew that they would be on travel or unable to complete a course module, they were not able to participate in the online course.

Use of the Course Manual

The traditional course manual was not referred to during the online course. The tone and words in the traditional manual were more formal and the order of topics had been modified for the online course. She felt the learners would be confused if the traditional manual was referenced.

Benefits of Learner Control

The greatest benefit was that the online course provided a learner-controlled environment. Participants had time to work on their own presentations and received individualized coaching on

the best ways to develop their presentations as they went along. The course followed a time line that enabled the trainer to monitor progress while keeping time commitments flexible.

Maintaining Learner Interest

For the videoconference portion, Ms. Longnecker shared some of her tips for keeping the learners interested. She uses a greeting card tailored to the participants to welcome them. They play the Jeopardy game show theme when testing learners' knowledge. To keep breaks short instructors use a stopwatch on the graphics tablet and do a verbal countdown for the final seconds.

Number of Sites

The *Better Briefings* online course is conducted point-to-point for the videoconferenced portion. They have not tried to include multiple sites in one course. The number of participants is kept to a maximum of eight. Differences in time zones do not affect the exchange of information. When a question requires an immediate response, a specific time period such as afternoons on the east coast and mornings on the west coast is designated so that all participants are in the office.

Ms. Longnecker recommended a GAO publication, *Video Teletraining: A Guide to Design, Development, and Use,* GAO/TI-95-1.

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Catch the Wave III

MSgt George W. Nelson, Jr., U.S. Air Force

Session Overview

From lowered costs to increased productivity, the use of interactive video teletraining (IVT) has numerous benefits. Broadcasting via satellite from Keesler Air Force Base, Mississippi, MSgt George W. Nelson, Jr., of the Air Education and Training Command (AETC), U.S. Air Force, used the IVT technology he applies to aircraft maintenance training courses to present the benefits of IVT to the Government Learning Technology Symposium. He used a one-way video/two-way audio system; "push and talk" technology enabled him to communicate one-on-one with Symposium participants.

MSgt Nelson opened with *Catch the Wave,* a short videotaped overview of IVT produced by AETC. He followed the video with demonstrations of some of the IVT tools he uses to increase educational effectiveness, and went on to describe the benefits of IVT and the state of training capabilities within the U.S. Air Force.

IVT Training Tools

MSgt Nelson demonstrated several technologies as they are used in IVT—

- Hard graphics
- Chroma key
- Still photos
- Computer graphics
- Full motion video.

Hard graphics. A "hard graphic" refers to a camera-ready still graphic such as a schematic. It fills the training screen as the instructor provides "voiceover" narrative. The instructor can zoom in on details and out again at will. Hard graphics can be stored on CD-ROM.

Chroma key. A "chroma key" refers to a photo that is projected full-screen behind an instructor who remains on-screen. To the viewer, the effect is similar to watching a televised weather report in which a map is projected on the back "wall" of a studio set while the on-camera forecaster, who appears to be standing in front of the map, points out weather patterns. Also like television weather maps, one photo can be replaced by another with a few keystrokes. In a typical course originating from Keesler Air Force Base, an instructor might use chroma key technology to show photos of an aircraft panel or component as the depicted device is discussed.

Still photos. Still photos are 5-inch by 7-inch glossy photographs or anything that can be presented under the visualizer. The instructor can chroma key into the pictures. Photos are handy because they can be used at will or on the fly. The instructor can take a picture tonight and use it in the morning.

Computer graphics. "Computer graphics" refers to still graphics stored in a computer. As needed, they are retrieved onto the computer screen, and that screen is presented as a full-screen graphic to the class. Computer graphics are similar in appearance to hard graphics, and are displayed on-screen in the same way. Also like hard graphics, a typical computer graphic is a technical illustration such as a schematic. However, with computer graphics the instructor can emphasize key points by using a "pointer" to draw on-screen (e.g., a circle around a detail in the graphic, or lines to emphasize the direction in which a process flows); computer graphics can also be used with two- or three- dimensional computerized animation, to show processes such as fuel flow, etc.

MSgt Nelson also demonstrated an interactive presentation system in place at Keesler AFB that adds color to the technology. That is, the instructor can change the colors emerging from the "pointer," selecting various colors to illustrate specific points or processes.

Full motion video. With "full motion video," an instructor can utilize videotape moving at real time to demonstrate actions that students will be taking on the job. The advantage over standard video play is that the instructor can stop the video at any time to illustrate a point, using the same pointer technology applied with still computer graphics to draw lines on the frozen frame. To the viewer, the experience is similar to watching a television sportscaster illustrate points about a completed football play by drawing on a frame "frozen" from the videotaped play. An Air Force instructor might use the technology to draw attention to details in a schematic or to a specific step in an illustrated process.

IVT tools for the future. In the future, Air Force instructors will expand their warehouse of IVT tools to include simulation training software, which is now in development at Sheppard and Keesler Air Force Bases, and live component identification (e.g., aircraft components brought into the studio-classroom). At Sheppard, IVT instructors are already beginning to apply animation techniques (including three-dimensional animation) to bring schematics and other graphics to life. With animated graphics, instructors can demonstrate how things work.

The Benefits of IVT

MSgt Nelson noted that IVT has several benefits that give it a distinct advantage over conventional classroom training. They include—

- Training at home station, resulting in improved morale and increased productivity
- Trainer availability
- Ability to bring the world into the classroom
- Potential cost avoidance.

Improved morale and increased productivity. IVT technology makes it possible for personnel to receive the training they need without leaving their home stations. Less time spent traveling means more time at home with family and familiar surroundings. The outcome is improved morale for both the students and their families. In addition, students who are trained at their home stations can work at their jobs during hours they would otherwise spend traveling to a

training site. Further, home-station students can maintain contact with their co-workers on training days, and even continue to work between sessions.

Trainer availability. Because more students can be trained with each class offering, and because instructor travel time is reduced or eliminated, instructors are more available.

Bring the world into the classroom. IVT, said MSgt Nelson, brings the "world into the classroom." That is, components, models, systems, etc., that are unavailable in a student's environment but important to his or her training can become a part of the training experience via satellite broadcast. In addition, IVT can expose students to real-life work situations without exposing them to work-related safety hazards that they are not ready to manage.

Potential cost avoidance. Costs will be incurred by any organization establishing IVT capability. AETC spends about $8,500 for basic site equipment, including an integrated receiver decoder (IRD) and satellites; total costs, in some cases, can go as high as $20,000. Despite the initial outlay, however, the potential savings are significant. The Air Force estimates that the total cost of sending a student to a conventional class can reach $1,800 per hour. The cost per student hour for IVT training is $200.

Training Capabilities

Use of IVT. In 1997, AETC graduated more than 1,550 students in 52 separate IVT courses, utilizing capabilities built over a three-year period. The courses originated from Sheppard and Keesler Air Force Bases, two of the four bases that comprise AETC's distance learning operation. Sheppard has two studios, which went online in 1995; Keesler's studio has been online since 1996. In total, more than 1,700 class hours have been broadcast to date.

Development process. AETC began initial course development in July 1994, when a single instructor converted an entire course for IVT delivery. In July 1995, AETC moved to development teams, and completed the quantified conversion process; in January 1996 courseware distribution was underway. In January 1997, the converted courses were delivered to the squadrons.

Media input. Media capabilities were developed over the same time frame. AETC had single-format linear videotape capability by November 1994, and two-format linear videotape, CD image, and computer graphics/application capability by November 1995. Course developers began to work with two- and three-dimensional animation in November 1996, and with interactive simulation software in November 1997.

Worldwide Delivery. The ATN has 76 operational downlink sites and 4 uplink sites. The ATN can also broadcast to the Air Force Reserves Air Teletraining Network and the Warrior Network. European sites are scheduled to open in early 1998.

Conclusion

MSgt Nelson cautioned those who are weighing the potential value of IVT in their own organizations to consider their needs. More specifically, it is critical to have clear answers about the number of people who require training and their locations before making a decision.

Discussion

Monitoring Student Progress

After experiencing one-way video/two-way audio IVT technology firsthand, one participant asked how an instructor can really gauge how students are doing if the students cannot be seen. MSgt Nelson explained that he places facilitators in each remote classroom to help him ascertain student progress.

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Statistical Differences in Student Attitudes Utilizing Technology Mediums

Kenneth A. Johnson, DoD Satellite Education Network

Session Overview

Studies show that students can achieve as much in a distance learning environment as they can in a conventional classroom, even when they prefer a traditional setting. Nevertheless, student attitudes toward distance learning can have an impact on their success, so attitudes need to be measured and considered.

Recognizing that a student's attitude toward distance learning can become a student's reality, Kenneth A. Johnson of the U.S. Department of Defense Satellite Education Network has explored attitudes and their impact on distance learning achievement. In his presentation to the Government Learning Technology Symposium, Mr. Johnson shared with participants his findings in regard to—

- Student attitudes—what attitude is, and how it is discerned
- The effects of attitude on learning
- Quantitative measurement of attitudes
- Factors underlying student satisfaction.

Attitudes and Distance Learning

Numerous studies have shown that the distance learner is not at a disadvantage. Nevertheless, as the 1997 publication *Review of the Literature: Interactive Video Teletraining In Distance Learning Courses* (presented to this Symposium by Hank Payne) points out, student perceptions are important. And perceptions cannot be separated from attitudes.

Borrowing from a 1935 statement by Alport, Mr. Johnson defined "attitude" as a "mental and neural state of readiness." Attitude, he said, has three components: the cognitive component (the idea); the affective component (the emotions); and the behavioral component. Recent research on attitudes toward distance learning has focused on these three components as well as other elements of attitude, all of which are interwoven:

- Degree of intensity (how attitude affects the learner)
- Mental effort (the amount of effort a student will contribute in order to learn via any method)
- Cognitive constructivist theory
- Attribution theory
- Cognitive style.

The Effects of Attitude

Attitude is perceived as reality, and it can affect achievement in a distance learning environment in several ways. A student's attitude can influence his or her own behavior, and it motivates behavior in others. It can affect teachers and learners alike, in both positive and negative ways. Attitude has intrinsic and extrinsic attributes.

Quantitative Measurement of Attitude

Because perception becomes reality, it is important to know what students feel about distance learning. But how is perception measured? Mr. Johnson offered four methods for quantifying attitudes:

- Semantic differential inventory
- Student opinion inventory
- Purdue Cafeteria Course and Instructor Appraisal
- Telecourse evaluation questionnaire.

Quantitative attitude measurements can be taken while a course is in session, immediately after a course ends, or at a later time.

Factors Underlying Student Satisfaction

Beyond merely discerning what prevailing attitudes are, it is important to understand what factors commonly influence student attitudes, or satisfaction. Mr. Johnson suggested the following:

- The instructor and the instruction
- Technology
- Course management
- At-site personnel
- Promptness of material delivery
- Support services
- Out-of-class communications with instructor.

Mr. Johnson expanded on the use of technology in the distance learning classroom, noting that despite its relevance to successful distance learning, it should be transparent. That is, the student should benefit from technology without even being aware of its presence. In regard to course management, Mr. Johnson stated that good course management is important not only during course delivery, but also in advance of the offering.

The presence of personnel in each remote classroom is also an important factor. At-site facilitators are important to the success of any distance learning course. Just as important are adequate student support services and opportunities for communication outside the classroom—student-to-instructor communication and student-to-student communication. Venues such as Internet chat rooms and bulletin boards promote student intercourse.

Discussion

Education or Technology?

Asked whether a distance learning instructor should focus on technology or on education, Mr. Johnson responded that it is his premise that education always comes first. Define the problem, he said; then select the technology.

Mr. Johnson believes that as an educator he should focus on education and allow others to use their technological skills and knowledge to support the educational process.

Performance Projections

In response to a question as to how the elements that will cause a student to perform well in a distance learning environment can be predicted, Mr. Johnson noted that the ability to identify these elements will increase distance learning effectiveness, but that practitioners are still searching for answers. Factors such as age, sex, length of service, and previous experience with satellite courses do not appear to have a bearing on performance. In his own courses, Mr. Johnson is using telecourse evaluation questionnaires to explore the impact of other factors, e.g., course length and grading systems.

Resource Sharing

One participant expressed concern that many course developers are already working to capacity. How can they find the time to devise different ways to teach the same courses? Mr. Johnson responded that finding more development time is not necessarily the answer. Perhaps someone else has already devised the new approach you need. Tap into the resources of other organizations, he suggested. Share ideas and products. Don=t reinvent the wheel.

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Video Teleconferencing in the Department of Veterans Affairs

Michael J. O'Connor, Ed.D., Department of Veterans Affairs

Session Overview

Dr. O'Connor, who is the Director of Research for the Learning Technology and Media Division of the Department of Veterans Affairs (VA) Employee Education System (EES), discussed the creation and implementation of a 24-site, nationwide video teleconferencing system to meet the educational, consultative, and administrative needs of the VA EES. Russ Culbert, Jr., an international distance learning specialist with V-Tel Corporation, who also worked on the project, joined the group via video teleconferencing from Texas.

Background

The Department of Veterans Affairs is involved in a large restructuring effort that has required changes in the educational system. Today the EES has to educate and train all employees, while in the past training was targeted primarily at clinical employees and senior management. Responsibilities for EES have increased ten-fold. The environment of the VA is one in which there is increased competition for government dollars, increased competition for patients for VA hospitals, increased demand for quality, and a demand that training be able to be self-supporting and pay its own way within the organization. The EES in the past had been viewed by many as unresponsive and unproductive, rather than being bottom-line and strategic.

Change for the VA educators and trainers was achieved through focus on customer needs, greater visibility, more emphasis on products and services, building on strengths, and recruiting to fill gaps where weaknesses existed. Trainers evolved into performance consultants. EES shaped its vision to become the educator of choice for a virtual, comprehensive organization of education and learning, by embracing distance learning, collaborating with industry, agencies, and universities, and by adopting videoconferencing technology. This reinvention brought EES from a hierarchical structure with many field units to a virtual organization with a product line.

EES is now divided into several divisions: Educational Services and Partnerships, Operations, Learning Technology and Media Development, and Product Development. Virtual teams develop around the functions. The idea is to be flexible and adaptable for the future, rather than holding a rigid structure that cannot as easily respond to change.

VA Mission and Environment

To meet the needs of its customers, EES had to understand how the external environment for the VA had changed. The VA is involved in medical work, but it also is active in health professional training (one of the largest such institutions in the world) and research. It also acts as a safety net for veterans and the Department of Defense in the advent of war. The VA is now a health care

system, not a hospital system. It has a new set of strategic goals, which include enhanced quality, information management improvement, equitable resources, enhanced collaboration with the Department of Defense, lower operational costs, and providing good value.

Factors In Choosing Video Teleconferencing

In selecting its communications and education technology, EES looked for these criteria:

- Ability to collaborate and educate. Collaboration would include delivery of consulting services, education, meetings, and staff development. Education encompassed distance communications for planning and debriefing.
- PC-based
- A network interface
- Ability to access the Internet
- Two-way video communication
- Simple to operate
- Windows-based
- Ability to share applications
- Remote course control
- Ability to have sending and viewing of both video and data simultaneously (dual monitor)
- Ability to show documents that could not be digitized.

Video teleconferencing was the only technology that could meet all these criteria. EES wanted their employees to be able to communicate not only internally, but externally with other publics, an objective that has been accomplished through a number of bridging systems for the network. The network is composed of full duplex videoconferencing, which can run either at 384 kilobits per second or at 512 kilobits per second.

Factors In Planning for Video Teleconferencing

Dr. O'Connor offered this advice to those considering videoconferencing systems:

- Clearly define what is to be accomplished.
- Do a needs analysis of your customers.
- Make a matrix of problems and possible solutions.
- Conduct a cost/benefit analysis.
- Write in criteria for how success will be evaluated. This will avoid *ad hoc* evaluations after the system is installed.
- Think about current engineering technology standards and try to project where they are headed. Don't get locked into a proprietary system that will limit access.
- Consider what you will need in terms of peripheral equipment and room design, such as lighting and sound.
- Know how you will handle approval of funding and procurement, management of the system, and maintenance; and know who will champion the system and provide support as you are building it.

- Make sure your time lines for funding match your time lines for acquisition and installation of equipment.
- Be aware that you may encounter some gamesmanship in the installation process at various locations. For example, some VA facilities wanted EES to pay for the installation of the entire facility communications infrastructure. Be prepared to examine these requests carefully.
- Consider the cost of field training in your projections.

VA Implementation Time Line

The VA system time line was as follows:

- Funding was obligated in September of 1996.
- Implementation began in October. Site design, engineering, and installation was outsourced. This turned out to be cheaper than doing it in-house because of the design and engineering expertise of the consultant.
- Eight sites, including two bridge sites, were operative by July of 1997.
- Twenty sites were operative by September of 1997.
- Twenty-one sites were operative by January 1, 1998; only two more to go.

Delays occurred first in site visits and identifying needs, and later in coordinating installation of the ISDN lines. A further delay occurred when funding was temporarily frozen for several months.

Other Features

Russ Culbert from V-Tel then presented from Texas. He said videoconferencing is an important concept in education that allows the instructor to progress from the "talking head" model to being more of a facilitator. This is because the system allows for the sharing of all sorts of data and collaborative computing. Conferencing systems, telecommunications, and TV broadcasting technology are the three technologies that make the V-Tel system possible. An instructor can use the PC to show a CD-ROM clip and then open up a Windows 95 application, for instance. This fully interactive model allows one to move freely between a LAN, the Internet, and a PowerPoint presentation. Documents also can be created using a smart board similar to a chalkboard, and then can be stored to a floppy disk and sent or printed as needed. All these features increase the potential for interaction among students and between student and teacher.

Discussion

Communication Costs

A participant asked about charges to pay the monthly bills for the communications infrastructure necessary for the videoconferencing. Dr. O'Connor replied that these bills are lumped together with the telephone charges for each site. Hospitals absorb the charges. However, a rule of thumb is that two-way calls cost about $2.00 per minute, and seven-way calls cost about $7.00 per minute, and so forth. There are no bridge fees because VA owns its own bridges. Bridge fees

may run as high as $1.00 a minute and more, depending on level of service requested. Mr. Culbert said the cost is about two times the normal audio telephone call.

Control of Screen Display

Another participant asked how you control who is on the screen at any given time. Dr. O'Connor replied that there are two ways to do it: have the video follow the audio, so that when someone asks a question he or she will appear on camera; or hold control at a central location, such as an instructor's site. Mr. Culbert mentioned that KPMG Peat Marwick in Northern New Jersey has integrated the One-Touch system into their V-Tel products, which run on a LAN (local area network). He said V-Tel is working on a system similar to One-Touch internally, which will be unveiled in about a year. He said V-Tel is also working on a product that will allow transmissions over the Internet.

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The Sum of the Parts: The Roles of Teams in Developing Computer Based Training

Ellen Epstein, Environmental Protection Agency

Session Overview

In this session, Ellen Epstein of the Environmental Protection Agency's National Enforcement Training Institute (NETI) answered the question: Why Teams? She looked at team dynamics and how they change during a computer based training (CBT) project, the benefits of a team approach, and how to find and bring on board good team members.

Background

Ms. Epstein has been a computer based training developer for five years. She has worked on teams that were made up entirely of in-house people as well as on teams that included outside contractors. Citing the fact that CBT development is time-consuming and complicated, she stated that a good team is critical to successful development. Several of her team members were in the audience, as were many CBT developers from different agencies and military branches. Audience discussion was informative and substantial.

Why Teams?

Ms. Epstein provided three reasons why a team is a vital ingredient in the development of quality CBT:

- *Focus.* It is helpful for different people to focus on different aspects of the project. The team lends uniformity and can ensure that all tasks are completed.
- *Diversity.* In a group situation there are no blinders. Everyone has opinions. By combining everyone's ideas, the final product can be more innovative.
- *Momentum.* Ms. Epstein pointed out that it can be hard to stay excited throughout a project, but in a team, someone always has renewed enthusiasm.

CBT projects often need critical mass, said Ms. Epstein. Three people seem to justify a project and help sustain one another through the process. She warned, however, that it is necessary to schedule extra time if more than five people are on the team. It takes longer to complete tasks with more individuals. It is also possible to have too many people on a team, she said. If managed well, individuals can participate on multiple teams provided time requirements permit.

For a new project, Ms. Epstein said, she holds a kick-off meeting for everyone on the team, including subject matter experts. At the meeting, roles are clearly defined for everyone.

She cautioned that rigid deadlines should not be set, especially if the team members are not dedicated to the project. Getting to the end is evolutionary, she said.

Ms. Epstein acknowledged that small projects might not require a team. She advised those with some computer skills, however, to be careful, warning that it is possible to get into trouble with the new software. It is better not to do CBT if it is not done well.

How Teams Form

Ms. Epstein cited research on how teams form conducted by Douglas Peters. There are four stages:

- *Forming.* This is the initial stage when the team begins to take shape. Members introduce themselves and exchange stories and experience. At this point, teams also start considering formal processes they want to move them through the project.
- *Storming.* During this stage, individual team members start to argue with one another as they work out where they fit in the team. This phase is characterized by conflicts and clashes. Storming can be minimized if roles are defined in advance.
- *Norming.* People start to settle into their roles in this stage. Things start to get done.
- *Performing.* Ideally, everyone starts to work together in a seamless manner to get the work done. Everyone on the team pulls together.

There were many audience comments at this point. One comment was on the definition of roles in the forming stage. Suggested roles included each of the small tasks required to get the project done: file archiving, file backups, for example. Ms. Epstein explained that it is important to assign responsibility for each of the small tasks.

The audience and Ms. Epstein also discussed what happens to the team when a member joins or leaves in the middle of a project. One participant said that the team falls back to the storming stage each time someone new joins the team.

When using an outside contractor, Ms. Epstein recommended finding a company that has a team that has worked together for a long period of time. The contractor's team will go through the same four stages and it is beneficial if they are already at the norming or performing stage.

What are the Roles in a Team?

It is common to combine roles, such as project manager and instructional designer, or programmer and designer, according to Ms. Epstein. She said that the role of audio engineer usually goes to whoever has the skills. Other roles include graphic designer(s), animator(s), videographer, and subject matter expert. The project manager is responsible for overall management and organization.

Ms. Epstein said that it is often helpful to have more than one graphic designer/animator. One can do the rough-out work, the other, the details.

Another valuable team member is a hardware person. He or she can be *ad hoc*, but someone needs to be identified who can repair and maintain the hardware.

Even after assigning responsibilities, she noted, everyone will still have input at the various stages. Defining goals is crucial to getting the process moving.

Areas of Conflict

Whenever you bring in individuals from different disciplines, you will have conflict, said Ms. Epstein. Most team members come from different backgrounds, as well, and this can set up other areas of conflict, such as art versus science.

She also noted that each team member has a personal working style. Some are messy; others are neat and extremely organized. She suggested instituting minimum guidelines for work and individual workplaces.

Another area of potential conflict is the bird's eye versus eagle's eye view. Each team member will have a different perspective on the project. Details may be important for some, while others look at the whole project. Again, Ms. Epstein said that goals can help the team work together.

Formalizing the Process

As soon as the team members are identified, Ms. Epstein recommends establishing goals. There are two types of goals: project goals and management goals. The project goal answers the question: What are you trying to do with this CBT? Length of time for completion is a typical management goal. She recommended working on goals during the kick-off meeting. Everyone should understand the parts of the project as well as the specific tasks and goals.

Once the project and goals are discussed, formalize the process, said Ms. Epstein. When using contractors, ask if they have a formalized process. They might not share it, but they will indicate whether or not they do follow such a process.

Finally, define the terms. Each team member will have a different vocabulary. The same word might mean different things to different individuals. Write down the terms and their definitions and give each team member a copy.

Conclusion

Ms. Epstein concluded the presentation by saying that to be successful, the team must have—

- The right people
- The right process
- Enough time to get the job done.

Discussion

Rapid Prototyping

Several audience members commented that they had used or were going to be using rapid prototyping as a way to speed up the development process. Ms. Epstein commented that the CBT development process is a creative process that cannot be easily tied to a paper base.

Another audience member said that she combined storyboarding and rapid prototyping. The two pieces helped keep management from changing their minds. Management approved a storyboard scenario and then saw it on the screen.

Other audience members said that they use electronic storyboards. They create the text and graphics and show the screens for approval before they program the interactive elements. This reduces time spent coding. They suggested showing a box that tells what the interactive elements will be.

Working with Contractors

An audience member recommended gathering information and putting together a package of ideas and then handing it to the contractor. This was preferable to doing it piecemeal. A set schedule to review the contractor's work was suggested. It also was recommended that subject matter experts review progress on a scheduled basis. This keeps the approval process on track with production. Ms. Epstein said that she includes management reviews in the process and has not experienced problems so far.

Getting Feedback

Audience members were curious about how Ms. Epstein received feedback on the completed courseware and whether or not she felt feedback was important. Her response was yes, feedback is important. Some of the methods she suggested or has used include—

- Putting a feedback form online at the end of the CBT lesson or course. After the exam, learners complete and print the form. They have to send it back to receive the completion certificate.
- Embedding coding to identify where the learner has a problem. With this information designers were able to analyze the learner's responses.
- Designing a formative evaluation that occurs during course development and a summative evaluation at the end.

Software Packages

Audience members and Ms. Epstein shared their preferences and experience with a number of software packages, including ToolBook, Adobe Photo Shop, Authorware, Adobe Premier, CBT Express, and Icon Author.

Following are some comments about the software packages made by audience members and Ms. Epstein:

- *ToolBook*. Preferred because it is familiar; more flexible; the latest version allows drop-ins; allows development page by page; needs more coding than some other packages.
- *Authorware*. More of a flow chart structure, must remember where you are; not as intuitive as the page concept; can get into extensive programming, branching, and looping.
- *CBT Express*. Preferred for those with no programming experience; has drop-in capabilities for graphic, audio, and visual files.
- *Icon Author*. Can get into intensive programming, branching, and looping.

Designing for the Web

Shockwave was the software discussed for putting CBT on the Internet. Ms. Epstein said that in the future, a Web master probably needs to be part of the development team. Audience members also had experience using a contractor to convert for the Internet. Several were designing for the Internet from the very beginning using an online color pallet and files sized for the Internet. They felt that this would be beneficial in the future because the CBT would not need to be retrofitted.

Ms. Epstein suggested analyzing the target audience when considering whether or not to design for the Internet. Most have PCs, she said, but do not have Internet access. Her organization is not looking at the Internet at this point.

Audience members also had experience with hybrid CBT—CBT that uses CD-ROM and Internet-based information. The general feeling was that if learners go to the Internet in the middle of a course, they never returned to the CBT.

Getting More Information

Ms. Epstein recommended the following Web sites for additional information on teams:

- *www.multimediator.com* - Everything you want to know about CBT
- *www.eyemedia.com* - Technical information about CBT
- *www.pmi.org* - Project Management Institute's Web site; general information about team management and development; includes on-line bookstore.

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Application of Department of Veterans Affairs Nursing Software Multi-media Training System

David Raney, Ph.D., Department of Veterans Affairs
Roberta Krol, RN, Omaha VA Hospital

Session Overview

This session demonstrated the Department of Veterans Affairs (VA) training approach to the application of specialized VA nursing software—and how that training approach has evolved into a multi-media system. The following topics were presented in this session:

- An overview of the VA's training process
- A description of the VA's Nursing Training Workgroup: a virtual team that designs training materials
- A demonstration of some of the training materials
- A description of lessons learned.

Background

Dr. Raney started by defining some key acronyms and terminology used with the VA's training:

- *ADPAC - Automated Data Processing Application Coordinator*. ADPACs are trainers at VA facilities who have skills in a particular discipline; nursing ADPACs, in particular, are skilled in clinical care. ADPACs conduct classes using training software.
- *VISTA - VA Information Systems and Technology Architecture*. VISTA is the information system used by the VA at its health care facilities for operations, training, and administration. It is detailed and complex software, and has been through several iterations. ADPACs are trained in its use.

The VA environment. The VA environment has changed significantly over the past several years, Dr. Raney observed—a situation that must be acknowledged when developing training and instructional technology. The Veterans Health Administration (VHA) is the largest of the three branches of the now-reorganized VA. The VHA now has 22 integrated service networks; its focus is on primary care, managed care, and outpatient services, and its primary objective is to render quality care to veterans.

The Chief Information Office (CIO) produces the software that runs these systems; it also has an effective training operation. The Employee Education System (EES) is a reorganization of the VA's regional medical information centers; within this framework, there is a Learning Technology and Media Development division, which includes a research branch that explores new applications. There is also a Development Group, which plans budget and canvasses clients to help determine whether new media are really needed. Overall, there are about 300 employees in the EES, 60 of whom work in technology development.

It is important, Dr. Raney said, for the CIO, EES, and subject matter experts to collaborate when training the target audience. It is a train-the-trainer process; the nursing ADPACs, who are initially the target audience, in turn train the end users of the system. The VA pays particular attention to delivering the information to the field offices using distance learning media wherever possible. The ultimate goal is to effectively implement the nursing software so as to enhance patient care.

A VA training team consists of the Nursing Training Workgroup, an instructional designer, and, if necessary, a media specialist. Although their internal resources are utilized to the fullest, there is also collaboration with commercial vendors. The VA depends on feedback from both the nursing ADPACs and end users.

Nursing Training Workgroups. Roberta Krol, Education Coordinator with the Omaha VA Hospital, identified the members of the Nursing Training Workgroups:

- Programmers who write the software, enhancements, and patches, which are upgrades sent out to field offices
- The nursing training group: five nurses who hold monthly conference calls to discuss issues arising from changes in the system
- An EES representative
- Media specialists.

The workgroup's mission is to identify the training needs of the nursing ADPACs, and to design and develop appropriate training in response. The workgroup delivers and evaluates the training, and revises and redesigns it as necessary. The workgroup also assists in the implementation of software.

Training for the Nursing Software Package

Dr. Raney and Ms. Krol then discussed the VA's training approach for the nursing software package. The approach is multi-media, and includes written documentation; whenever a software package is designed for the VA, the developers produce thorough technical documentation that, while excellent reference material, is not designed as a training aid. The software package itself is a data base; the nurses are trained in how to convert and enter information into the software's data fields. The software is written in the MUMPS program; its description is in Fileman.

The multiple approaches used in the VA training for this software include—

- *Audio-visuals*. These employ a variety of techniques, including a vitals measurement videotape matched to printed exercises and evaluation sheets. This is sent to both the nursing coordinator and the site library.
- *Computer based training*. This includes computer audio tape training (CAT), a unique method that allows for descriptions of individual screens.
- *Face-to-face training*. Although this can be time-consuming and expensive, it is necessary as a forum for sharing ideas with peers, and for providing an informal

environment for training. A regional education initiative from 1991 to 1995 focused on training the ADPACs.

- *Practicums*. A practicum is a one-on-one approach that uses a customized training session to aid individuals who express a need for specific training. The practicum is hosted by a "preceptor," an experienced ADPAC who conducts the one-on-one training. There are about 30 preceptors across the country; preceptors need to be good instructors. The practicum sessions can vary in length, from two to five days; both parties agree on the length prior to the start of the session. When new ADPACs are identified, they are contacted and asked about their experience, and about the kind of training and software they are using. When a call for help comes in from a new ADPAC, a practicum is then tailored to his or her specific needs. The new ADPAC's facility generally pays for the travel costs to the preceptor's site. During the practicum, distance access to the new ADPAC's site is often established from the preceptor's location.
- *Conference calls*. These are on a regional basis. The calls are a forum for sharing problems, experiences, solutions, and new technologies, and the calls cover all aspects of nursing.
- *A comprehensive training manual*. The manual includes 800 pages of material, aimed at the ADPACs, with a lot of exercises that can be used by the ADPACs in their training. This hard-copy document continues to be the core of the system, although a version on CD-ROM, which is both more compact and easier to update, is coming along.
- *Quick reference guides*. These are presented in a question-and-answer style.

Impact of Organizational Change on Training

Dr. Raney illustrated the impact of organizational change on training by focusing on a particular situation. There was a need identified for educational tracking software; the nurses wanted oversight on the development to ensure that it was a good package. The VA's instructional development branch, therefore, assumed the responsibility, ultimately developing a three-part video series to provide training on the system once it was developed.

In 1992, the VISTA software system was designed to track educational activities. In 1993, five sites offered to be alpha test sites, allowing them to have a direct impact on the software design. In 1995, there was a reorganization of the VA, resulting in a shift from services to product lines; concurrent with the design of training was this organizational turmoil that had to be accommodated. Training videotapes on the software package were created in 1996, and finally distributed in 1997. Because of the organizational changes, Dr. Raney observed, it took five years to create and distribute a training aid on the newly developed tracking software. He then showed a promotional video clip on the software.

Training challenges. Dr. Raney then reviewed some of the challenges in developing and implementing the training materials:

- *Getting the training distributed in time to make it effective*. Software packages are being generated very quickly.

- *Making the training interactive*. New technologies help.
- *Motivating adult learners*. This involves more than simple training in computer skills; learners want specific examples of how the software will aid them in their jobs.
- *Teaching the software in the context in which it is utilized*. This involves instruction in the structure of the nursing service and the principles of its operation.
- *Creating opportunities for practice and feedback*. This is important whether the training is delivered by media or face-to-face.
- *Ensuring that all facilities have access to the chosen delivery medium*. VA facilities, which may not yet have access to CD-ROM technology, all have videotape players.

CD-ROM product. Dr. Raney then demonstrated an electronic version of the VISTA Nursing 3.0 Training Guide that is available on CD-ROM. Its features include—

- Efficient packaging of all of the printed information from the manual
- Fast searching of content by key terms, by individual words or phrases
- Use of bookmarks to help in navigation
- Allows the ADPAC to tailor specific portions of the training guide to meet specific requirements of its VA medical center
- Video segments to heighten interest and clarify teaching points; clips are on subjects such as the module for online tracking for automating patient intake/output data; the vitals measurement software module; and education tracking
- Internet links to technical documentation of the nursing software.

As a learning organization, Dr. Raney observed, the VA emphasizes active learning in an evolving process. They train for impact; to deliver materials "just-in-time" rather than "just-in-case;" to focus on core competencies, including technical; to be workplace-oriented; and to be tied to organizational goals.

The response to these efforts comes from satisfaction surveys and follow-up questionnaires; an evaluation survey will be forthcoming in the 4.0 version. There has been a positive response to the first version of the CD; an update is scheduled shortly, as is an Internet site. Also planned is embedding help screens into the software.

Lessons Learned

Dr. Raney concluded by highlighting some of the lessons learned in the VA training experience:

- Understand the needs of the learner.
- Establish teamwork.
- Recognize that technology is a means and not an end; the technology should follow the content, not vice versa.
- Keep abreast of organizational, content, and process changes.
- Share information as often as possible.

- Aim to establish a knowledge-based organization; the more employees can be trained in technology and its implementation, the better off an organization will be.

Discussion

Collaboration

There has been some collaboration between the VA and the Indian Health Service, adopting each other's activities; the goal is to establish a computerized patient record. Many hospitals around the world participate in the VISTA programs.

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Teaching Interpersonal Skills Via Computer: Overcoming The Oxymoron

Michael Berney, Federal Judicial Center

Session Overview

This session was designed to illustrate the use of computer based training (CBT) to teach interpersonal skills. The Federal Judicial Center (FJC) designed a CBT program called *Supervision in the Courts* to help train its managers in interpersonal skills. In designing the program, the Federal Judicial Center incorporated elements such as tips, advice from colleagues, wallet cards, job aids, models, exercises, and additional resources, and followed recommended design principles.

The room was set up with laptop computers loaded with two CBT applications developed by the Federal Judicial Center: *Supervision in the Courts* and *Transition Guide*. As the session began, attendees broke into small groups and gathered around the laptops to try out the programs. Their reactions to the programs formed the basis of the subsequent discussion of problems, tips, and design considerations.

Objectives

Session objectives were to—

- Understand and discuss benefits of using computers to teach interpersonal skills
- Discuss advantages and limitations in using CBT to teach interpersonal skills
- Identify design principles.

Supervision in the Courts

Background. The *Supervision in the Courts* course was developed in response to the Congressional mandate to use money more effectively and efficiently. Initially, there was no interest within management to replace regional classroom-based workshops with CBT. Resistance was anticipated, since it was felt supervisors and managers would not want to give up travel opportunities. The existing classroom/intensive lab course already in place was a very popular course. And, there was some concern about the ability to change attitudes through computer programs.

Purpose. The program gives managers, supervisors, work leaders, and other individuals who supervise staff access to supervisory skills training as their needs arise. The program encourages careful thought to supervising others through a combination of tips, job aids, and other material. Individuals can use program exercises and resources on their own and with their staffs and co-workers. Thirteen topics are covered:

- Appraising performance
- Balancing priorities

- Building relationships
- Communicating
- Fostering teamwork
- Influencing and negotiating
- Knowing yourself
- Making decisions
- Managing stress
- Motivating others
- Staying flexible
- Thinking strategically
- Valuing diversity.

Development. The development team first identified all the potential problems in moving to CBT and weighed them against the potential advantages. CBT offered very strong advantages:

- Students could access the program at their own pace, according to their own needs.
- The computer addressed the awkwardness of interacting with strangers in conflict situations.
- Computers are more directive than books; books tend to sit on the shelf, while CBT tends to be used.

As supervision in the courts is very diverse, from old-school style to self-managed teams, the development team did not focus on star performers. Instead, they focused on issues in court management, couched as skills, and why each one is important or how it will help.

Hardware and software. The development team was committed to making the program a user-friendly electronic reference system. Using *Adobe Acrobat Reader* permitted users to install the program on their personal computers without taking up much disk space. Because of the variety of hardware and software platforms used throughout the court units, the program had to be designed for minimal standards. As a result, it can run on a 386 or 486 computer running with Windows 3.1, Windows 95, NT 3.5, or greater, or a Macintosh. 4 MB RAM and 900K space on disk are needed.

Development costs. No exact development cost figures were available.

Organizational impact. Although there is no data concerning effectiveness of the program, reactions have been positive. Organizationally, the Federal Judicial Center says the program has—

- Served individuals and courts who would otherwise miss the training (2,136 users in 1996 is a 360 percent increase over the 594 classroom attendees able to attend from 1991-1995)
- Augmented on-the-job supervisory performance, in the thirteen subject areas
- Provided cost savings to internal customers and taxpayers (in 1996, saved $1.3 million in wages and $1.7 million in travel costs)

- Made supervisory training convenient for learners and the court unit by providing around-the-clock access to training from any computer
- Overcame transfer of training obstacles by making tips, job aids, models, and exercises available to individuals when actual needs arise.

Reactions to the Demonstration Programs

In both the try-out groups and the subsequent small group discussions of design considerations, participants' comments included the following suggestions:

- Add variety, pictorial and textual, to appeal to all types of learners
- Add visuals and graphics to break up the text
- Accommodate different learning styles
- Need more interactivity; more learning by doing
- Good index, but avoid text-only format
- Linear exercises should be branched
- Doesn't take advantage of computer's ability to coach and provide individualized remediation, and customized practice scenarios
- Good to allow the learner random access, but always need a visual schematic on-screen to know where they are and where they have been
- Need more white space
- Take advantage of new compression techniques to allow more graphics
- Use scenarios to pique interest
- Make it come alive
- Need more self-assessments
- Use in conjunction with follow-up activities.

Recommended Design Principles

Mr. Berney summarized important principles in designing successful CBT:

- *Escape linear thinking.* Create a smorgasbord of information and activities, with something likely to appeal to every person's interest and learning style.
- *Chunk information.* Present information in "bite size" amounts—no more than half a screen at a time.
- *Provoke thought.* Include some ideas that cannot be taken literally, that force the reader to wrestle with a concept.
- *Direct people down the road less traveled.* Few supervisors enjoy 360-degree feedback. But if their interest is working more effectively in teams, such feedback is invaluable. Start people with straightforward advice, then lead them to activities that may require more work or that may be threatening.
- *Establish baby steps.* Have material that is directive at the front end of any section. Save the more involved work for later on.
- *Provide low hanging fruit.* Provide some activities that are truly simple and yield big benefits.

- *Think **Situational Leadership***. Some people may need to be told what to do, others may need to be sold, while others may need you to participate with them or delegate to them. Use Paul Hersey and Kenneth Blanchard's situational leadership theory as a lens to view the information and make sure that the solution satisfies the needs of these four different types of learners.
- *Coach.* Jack Gibb, in the article *When Is Help Helpful*, emphasized that advice invariably leaves the recipient feeling one-down. Therefore, adopt a tone that is collegial. Support; don't help.

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Forging the Links, Creating the Framework for Technology Partnerships

Anna Doroshaw, U.S. Environmental Protection Agency

Session Overview and Discussion

Welcoming the "full-house," Ms. Doroshaw stated that one purpose of the session was for government personnel to share news and information about technology and distance learning. The Symposium organizers also hoped to secure commitments from the agencies/individuals present to participate actively in related policy making and implementation. She called on specific attendees to speak.

Office of Science and Technology Policy

Henry Kelly of the Office of Science and Technology Policy (OSTP) assured participants that the White House is paying close attention to distance learning and technology. Although OSTP has initiated a large program for K-12 education, it also recognizes the importance of life-long learning. He noted that workplace managers are often more supportive of distance learning than are school-based educators. The forthcoming budget will include measures to improve all post-secondary learning, especially for the workforce. He referenced news headlines about the thousands of job openings in the software sector, adding that with technology changing every 18 months, just keeping up is a big challenge. Federal agencies have an obligation to the public to be exemplary users of technology, which means moving forward with distance learning and the use of technology in training. Agencies must show taxpayers that technology can make training better, faster, and cheaper.

New programs will encourage partnerships between government and the private sector. Mr. Kelly mentioned the Advanced Distributed Learning (ADL) project, which brings together the Department of Defense, the airlines, and the Bell Telephone Companies—all of which have huge training needs. Instead of each investing heavily to develop in-house training systems, these organizations intend to take advantage of components that are available commercially or on the Web. This should save time and money. In addition, enormous commercial possibilities exist for creative vendors. Interoperability is key to the success of this venture; therefore, an instructional management group called EDUCOM has been set up to create prototype standards (a common technical framework and common vocabulary). OSTP believes that the nation needs an open, competitive market in standardized networks, hardware, and software. Basic training models that use a common technical framework can be developed and then specialized for each agency or business.

Mr. Kelly urged the agencies to agree that the ADL approach is worthwhile. He recommended that public/private partnerships move immediately into operational mode and find (or have developed) training models on subjects of common interest to both sectors. As examples of the latter, he mentioned training courses for software designers, network administrators, vehicle

maintenance technicians, and procurement specialists. When Ms. Doroshaw asked what participants could do to assist OSTP, he replied that if ADL is going to be useful, the agencies need to try to agree on broad standards. They must encourage those with the same training needs to work together and agree on which commercial products to buy or have developed.

The Government Alliance for Training and Education

On behalf of the Government Alliance for Training and Education (GATE), Robbie Smith of the Department of Energy (DOE) noted that some government agencies interested in video teletraining have already pooled resources. She referred to the April 1996 satellite broadcast of a required ethics training course—an effort spearheaded by GATE. At Government Education and Training Network (GETN) sites nationwide, 7,800 government employees from different agencies participated in the course. Afterward, GATE received 2,000 requests for the videotape.

Hank Payne of the Federal Aviation Administration (FAA) explained that a subgroup within GATE devised the ethics training because some members were tired of talking about cooperation and wanted to "do" something about it. He urged all federal agencies to share training by exploiting the 14 FAA uplinks and 28 channels and the more than 1,000 GETN sites nationwide. Mr. Payne added that E-mail, chat rooms, and CD-ROMs with background information/research data can be used for pre- and post-broadcast exercises. He urged operations staff (who are often more in touch with technological possibilities than management) to push immediately for multi-agency training via satellite, even as OSTP and others pursue research into Web based or computer based training (CBT) ventures. Agencies should also start to quantify the savings realized by sharing uplinks and downlinks. He also referenced the Joint Committee on Computer-Based Instruction (JCCBI).

Although Mr. Kelly agreed that agencies must take advantage of the GETN infrastructure, he emphasized that the commercial world wants a commitment from the government to purchase off-the-shelf training products, which agencies will then customize. Ms. Smith commented that, even in the case of ethics training, it is possible for vendors to develop generic courses that can, in turn, be made site- or agency-specific.

Other suggestions offered by attendees at this point were as follows:

- Government experts should evaluate the Web's strengths and weaknesses and determine how agencies can take advantage of the Web for training.
- The government should publish a list of all commercially-available software useful for training.
- The government should set up a government-wide Intranet with a firewall that would allow agencies to share training courses immediately.

Government Information Technology Services Board

Ken Horowitz of the Department of Commerce briefly described the work of the Government Information Technology Services Board (GITSB). Action item #18 under GITSB's Access America plan includes the following subpoints: (1) Everyone who works for the Federal

government should have basic computer skills, and (2) The government should use the Internet to its full capacity. Expanding on the first point, Mr. Horowitz said that as the government downsizes, agencies are left with many people who lack computer skills. GITSB is suggesting one basic Web site for all Federal agencies that would offer training in basic core competencies and self-assessment tests. He announced that the General Services Administration may be prepared to sponsor this combined Federal site. If such a site exists, firms such as Microsoft and Corel may be interested in posting tutorials on the site with the hope that Federal agencies and/or employees will eventually buy their products.

To illustrate the second point, Mr. Horowitz asked attendees to imagine that a senior citizen accesses the Social Security Web site to change his or her address. The government database should be such that this person's address would automatically be updated in all agencies' records. Clearly, government employees need skills to make this happen. Everyone needs to be able to work on an Intranet and on the Internet.

He announced that GITSB had sent a survey to each agency's chief information officer (CIO) to find out what computer skills are needed, what training already exists, and what incentives the government should offer to keep skilled personnel. He asked if any of the attendees had seen the survey; no one had. A participant commented wryly that the staff who "do the work and know the needs" will probably never see the GITSB survey. Repeating that the government has an enormous need for computer skills, Mr. Horowitz urged attendees to contact him if they would like to know more about or get involved in GITSB.

Referring to the comment on software firms offering tutorials, an attendee remarked that the Veterans Administration (VA) already has cooperative ventures with Microsoft and other firms.

Another attendee who described himself as a Web advocate said that it seemed odd that GITSB is encouraging personnel to learn "basics" via the Web. Many Federal employees do not have access to personal computers, much less know how to use the Internet. Mr. Horowitz replied that the beauty of Web-based courses lies in "just-in-time" training. Staff train when they need it. He acknowledged that the Commerce Department, unlike other agencies perhaps, has very few technophobes.

In response to a question, Mr. Horowitz said that he was not opposed to using commercially available software to train government personnel in the core competencies. Core competencies, however, do not mean specific skills in a word processing package or a spreadsheet. Agreeing, Mary Taylor of the Department of Labor (DOL) said that government personnel need computer literacy. They need to know how and why to use different types of software or technologies to do their work and make business processes more efficient. Following on, Mr. Kelly stressed that technology only works when it serves the agency's bottom line. OSTP supports using commercial tools but recognizes that much of the currently available CBT is bad. He believes that if agencies can specify clearly what they want, commercial firms will write good CBT courses.

Centers for Disease Control, Department of Health and Human Services

Dennis McDowell of the Centers for Disease Control commented that in his view individuals should commit to life-long learning and train themselves (or seek out training for themselves); the government should not have to do it for them. That said, he explained that when he was asked to plan the Public Health Training Network (PHTN) to prevent disease and promote health, he met wonderful people and built lasting relationships. Mr. McDowell described how he was able to piggy-back on existing services in other agencies partnering to build capacity and deliver services. He encouraged attendees to get involved in inter-agency efforts because they provide the opportunity to share resources, ideas, and friendships. As a practical note, he added that PHTN trained 250,000 people in 1997 using no hardware except the GETN satellite infrastructure.

U.S. Environmental Protection Agency

Gerald Oakley of the Safety, Health, and Environmental Management Division multimedia development lab at the Environmental Protection Agency (EPA), stated that no one method or platform will reach every government employee. Distance learning via video conferencing and via the Internet are both useful. In the past six years, EPA has concentrated on developing performance support systems because employees leave (are downsized), but their work does not disappear. The Agency needed to find ways to make the jobs of the remaining staff easier. As two examples, he mentioned interactive forums and standardized report forms. EPA has also committed resources to developing CD-ROM training courses for use on LANs. Ten agencies, including the FAA, the Department of the Interior, and the U.S. Army, are using an EPA-developed CD-ROM course on radiation protection. Six years ago, no one believed that the traditional "talking heads" training program could be replaced. Now, everyone is clamoring for the CD-ROM multimedia products.

Dr. Oakley recommended that agencies work together to develop generic training courses. He agreed with earlier comments that government personnel need to know the concepts behind word processing, spreadsheets, databases, and other applications. Because people learn at different times and different rates, he advised offering training when they are ready for it. The Internet may be very useful for "just-in-time" training; however, in some agencies Internet access is limited.

Department of Energy

Wearing her DOE hat, Robbie Smith said that her agency shares others' concerns about safeguarding files and courses if and when access becomes widely available. DOE, nevertheless, supports inter-agency cooperation on training efforts. She commented that no training panacea exists at DOE; instructors use whatever training methods and technologies work best to meet the objectives. These include interactive teleconferencing, one-way televised broadcasts with two-way audio, CBT, and Web based training.

Ms. Smith announced that the Symposium organizers are updating the Resource Capability Directory, which lists agency resources and learning technology capabilities. Federal employees

wishing to add their agency information should contact her at 505-845-4804 or robbies@cta.doe.gov. The directory will be located at *www.fgdla.org*.

GATE Update

GATE also intends to publish a government-wide catalog listing the training medium or media available, the platform requirements, the cost (use fee), and the location (or portability in the case of CD-ROMs).

Ms. Doroshaw invited all interested attendees to participate in the GATE roundtable that afternoon, which would focus on (1) lessons learned from recent experiences with video teletraining (ITV), CBT, CD-ROM courses, and Web based learning, (2) issues remaining to be solved, and (3) ways to facilitate interagency cooperation. Ms. Doroshaw expressed hope that OSTP and all of the agencies would listen to GATE's ideas and incorporate them into Federal planning.

Mr. Horowitz commented that he had been involved in GITSB for one year and in that time had never heard of GATE. In reply, Lisa Nelson of EPA's National Enforcement Training Institute, and Symposium founder, explained that this lack of awareness among agencies was precisely the reason for the yearly inter-agency Symposium (now in its third year). Government personnel should not be duplicating efforts; they should be sharing resources. Ms. Nelson added that because the Symposium is limited to Federal employees and allows no commercial vendors, funding must come from each agency. She encouraged attendees to join the organizing committee and help solicit financial and moral support for the Government Learning Technology Symposium.

Federal Planning Efforts

An attendee from the Air Force said that the GSA-approved nationwide satellite system now used for uplinks and downlinks was put into place in spite of the bureaucracy that exists at certain management levels in all agencies. He asked whether OSTP intended to formally support inter-agency training efforts so that the enthusiasts (often workers at lower levels in the hierarchy) would not feel their efforts were in vain. Acknowledging that the enthusiasts in the trenches made the satellite system work, Mr. Kelly said that a forthcoming Executive Branch paper will encourage senior management to support the inter-agency training effort.

Mr. Payne wondered why the inter-agency effort is not centered in the Department of Education. Uncertain as to which, if any, agencies are working with OSTP, he urged all of the major players to be in electronic contact with each other so that efforts are not duplicated. Ms. Taylor took the opportunity to inform participants of the DOL Employment and Training Administration Web site, which links all DOL offices in the country (*www.dol.gov/eta*).

Department of Education

Walter Chiavacci of the Department of Education (DOEd) stated that his agency is developing core competencies for its information technology professionals. Anyone interested in more information or shareware can contact him via E-mail at walter_chiavacci@ed.gov. The Department intends to set up a learning network and take advantage of off-the-shelf products in developing interactive CBT courses.

USDA Graduate School

David Lamp of the Graduate School, USDA, explained that two years earlier the training function of the Office of Personnel Management (OPM) had been privatized. It is now completely self-financing at the USDA Graduate School. As a hybrid government organization, the Graduate School is the largest government trainer, and it intends to share its information with other training entities.

By June 1998, the Graduate School will provide agencies with an object-oriented relational database for organizing course content on the Web. Agencies will be able to upload training materials into a box after which the database can search and sort the contents and subsequently share materials via a template. This service will be called "AmeriSchool." The Graduate School hopes to attract a collaborative consortium who will fund AmeriSchool through membership dues and user fees.

Mr. Lamp said that in a sense the Graduate School will be "manufacturing" learning modules to distribute for "just-in-time" training. These materials represent the government's inventory, not unlike the inventory of parts used in an automobile assembly plant. Just as assembly lines can be customized to select parts and manufacture different models one right after the other, this mechanism will allow agencies to customize and "brand" courses located on the Graduate School Web site.

Follow-On Discussion - Strategies for Implementing Change

When time for the session had run out but the participants' ideas had not, the dialogue on inter-agency cooperation continued in another room. The small group in the continuation session discussed barriers to implementing change and technology innovations with Ken Horowitz, representative from the Government Information Technology Services Board (GITSB). Strategies for implementing change in an individual agency or program level were explored. The importance of building support and finding supporters within other parts of the same agency and across agencies was stressed.

An important message for Mr. Horowitz to convey to the GITSB was the need to tap the many networks of "doers" within the agencies. Relying on the traditional contacts and hierarchies leads to repeated failure to get the message to the intended audience or hear from those who are engaged in the work of implementing change across government.

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Electronic Meeting Systems: Facilitating in Electronic Environments

Sande Lehrer, Ph.D., U.S. General Accounting Office
Joshua Mintz, Cavanaugh, Hagan & Pierson, Inc.

Session Overview

Background

Every day some 11 million formal meetings are convened in this country. These meetings are costly. A typical manager dedicates from 30 percent to 80 percent of his or her time to meetings. When several managers or executives attend, meeting costs can exceed $1,000 per hour in salaries alone; total outlay for an off-site meeting can reach $10,000 to $20,000 per day.

With costs this high in both time and dollars, meetings need to be effective. But too often they are not. Meetings fail to achieve complete success because they lack a clear agenda or suffer from poor planning. Productivity diminishes when the group grows larger than five or six people. Many cannot be heard because a few powerful people or strong personalities dominate the proceedings. Participants tend to say what they think they should, rather than what they feel. The right people cannot attend, and the wrong people can.

In recent years a variety of Electronic Meeting Systems (EMS) have come on the market and are being employed to improve the quality of meetings and enhance learning. Though not a panacea for all problems and all meetings, there are many opportunities for advantageous EMS application, including meetings focused on—

- Mission and vision development
- Work process improvement/redesign
- Employee surveys and focus groups
- Training/education
- Strategic planning
- Team building
- Conflict resolution
- Change management.

As defined by presenters Sande Lehrer, Ph.D., of the U.S. General Accounting Office (GAO) Training Institute, and Joshua Mintz of Cavanaugh, Hagan & Pierson, Inc., an EMS is a computer based device used to facilitate meetings. EMS can be applied to a single meeting site or used to coordinate participation at multiple sites.

Dr. Lehrer and Mr. Mintz opened their presentation with a survey of the advantages and pitfalls of EMS. They followed up with a demonstration of Consensus Builder, one of several electronic systems on the market today. Symposium attendees participated in the demonstration.

The Advantages of Electronic Meeting Systems

Electronic meeting systems offer meeting planners three key benefits:

- Increased participation and communication
- Improved quality of the decision-making process
- Cost reductions.

Increased participation and communication. In an electronic meeting, all participants are issued keypads, keyboards, or other electronic devices. They use these devices to respond to questions, vote on issues, and express opinions. This system has a number of advantages over verbal participation.

In a conventional setting, it is not uncommon for one person to dominate a meeting simply because he or she has a powerful position, a strong personality, or a loud voice. With electronic communication, all participants have an equal opportunity to make their opinions known. In addition, electronic voting is anonymous, and the fact that they enjoy anonymity prompts some participants to say what they feel, rather than what they think others want them to say. And, because the system is computer based, it can generate specific voting results immediately, which can stimulate participation. Finally, the meaningful participation that meeting attendees enjoy can translate into a higher commitment during the post-meeting implementation stage.

It should be noted that "keypad" capability is not intended to eliminate or discourage open dialogue. In fact, in an electronic meeting environment, dialogue often becomes more meaningful and accounts for a greater proportion of meeting time (see below). At times, people who would ordinarily remain silent are encouraged to speak up because the results of anonymous voting show them they are not alone in their opinions.

Improved quality of the decision making process. Electronic systems can improve the quality of decisions made in meetings by reducing bias brought about by the presence of an influential person, providing anonymity, minimizing miscommunication and interpersonal conflicts, and reducing "groupthink." In addition, the larger meetings made possible by the use of an electronic system increase the size of the human database that can be accommodated; and the capacity to gather, collate, and feed information back to participants instantly serves as a motivator for participation.

The electronic meeting process also reduces the time required for the exchange of information, which in turn increases the time available for dialogue. Dialogue is important to the meeting process, and it often gets short changed. In a conventional setting, some 80 percent of meeting time is expended on "data dumping," i.e., the dissemination of preliminary information, with the remaining 20 percent divided between dialogue and action planning. An electronic meeting system nearly reverses the percentages. Data is disseminated quickly, allowing about 60 percent of meeting time to be devoted to dialogue and about 20 percent to action planning.

The electronic transcript that is automatically generated by an electronic meeting system can improve the quality of meeting outcomes as well. The transcript can be a valuable resource when the meeting ends and action begins.

Cost reductions. The cost savings associated with electronic meeting systems are achieved both during and after a meeting. They include—

- Less time spent in meetings
- Shorter project elapsed time
- Reduced labor costs
- Improved decision quality/fewer mistakes
- Improved buy-in to decisions.

EMS can help organizations reduce costs in these areas because participants leave meetings with a greater sense of clarity about the outcomes and a greater sense of commitment derived from their increased participation. In addition, with electronic systems, organizations have the ability to bring greater numbers of people together—either physically or electronically—because the systems allow meeting managers greater control over large groups. Large project teams can use this capability to increase cross-team communication, improve understanding of each other's viewpoints, and reach agreement on issues.

The Pitfalls

Despite their numerous advantages, electronic meeting systems do have pitfalls. Most of them, however, can be avoided with good planning and by keeping the following admonitions in mind:

- Don't let technology drive the process.
- Technology does not replace leadership.
- EMS affects how a group works.

Don't let technology drive the process. EMS is very well suited to large meetings where opinions are required, but it is neither appropriate nor necessary for every meeting. When simple yes/no answers are all that are needed, EMS can be an unnecessary expense. For example, a gathering of senior managers to discuss and develop an organization's mission and vision could be well facilitated by an electronic system. A meeting called to obtain a union vote would not.

Technology does not replace leadership. Technology does, however, change it. It takes different skills to be a leader in an electronic environment. One caveat is the same regardless of meeting setting: Don't rush to vote before reaching clarity on an issue.

EMS affects how a group works. The structure of EMS software may not fit a group's process. Perhaps the process can be modified to work within the limitations of the software; perhaps it cannot. The process must be considered carefully when making a decision whether to employ EMS to facilitate a meeting.

Demonstration of EMS

Dr. Lehrer and Mr. Mintz dedicated the second part of their presentation to a demonstration of Consensus Builder, one of the meeting systems available today. Consensus Builder is a DOS-based keypad system, which is currently being redeveloped for the Windows environment. Consensus Builder has the capability to tally inputs from participants instantly and to display outcomes in a variety of mathematical and graphical formats. Like other EMS systems, it generates an electronic transcript. System costs are estimated at $15,000 to $20,000 for a 20-pad system, with additional keypads costing about $250 each. The cost for a dedicated EMS room, containing a fully networked system, is about $100,000.

The presenters conducted the demonstration much as they would a regular meeting. They acted as co-facilitators, with one controlling the computerized system and the other noting ideas and viewpoints on a flipchart, as would occur in a conventional consensus-building meeting. Session attendees took the role of meeting participants, using keypads to communicate opinions to the facilitators. They viewed the results of their communications on a large screen at the front of the meeting room.

Starting with a few pre-programmed questions, the presenters helped the participants become comfortable with their 10-key keypads. To respond to a yes/no question, they pressed "1" for yes and "2" for no. To choose between two options, they pressed any key on the top two rows to select one option, and any key on the bottom two rows to select the other. (Each key on the keypad is numbered, and the keys can be used in different ways depending on the nature of the responses sought.) Each time the participants locked in their votes, the results were displayed on the screen. Voting is anonymous, and each keypad is limited to one vote.

Once the participants were comfortable with the system and the voting mechanism, the "meeting" got under way. The presenters demonstrated use of the system as an aid in prioritization and relative ranking.

Prioritization with EMS. Getting a large group to agree on the prioritization of a large number of issues can be a complex task in a conventional meeting setting. To demonstrate how EMS can be used to simplify the prioritization process, the presenters asked this question: What are the major technical challenges facing the government over the next five years? The participants broke into small groups to consider the question, and when they reconvened they put together a list of eight challenges. Dr. Lehrer recorded the challenges on a flip chart, assigning a letter (a, b, c) to each challenge. Mr. Mintz was careful to enter the challenges into the computer in precisely the same way they were recorded on the chart. (Note: The Consensus Builder system can accommodate approximately 25 items.) A brief discussion took place to ensure that all participants clearly—and uniformly—understood the meaning of each challenge. Then the process of prioritization began.

As the first item was displayed on-screen, the participants used their keypads to rank it from 1 to 9, with 9 being the highest priority. When all votes were locked in, the second item appeared and the participants voted again. This process continued until the participants had ranked all eight

challenges. (Each item was ranked independently.) The whole voting process took less than three minutes.

When voting was complete, the overall results were revealed in an on-screen graph. The graph showed not only the ranked order of the eight challenges but also the average score for each individual challenge. Taps on the facilitator's keyboard yielded new graphs that presented more information on the voting outcomes. For instance, one screen showed the range of scores each challenge received, which indicates how important each challenge is to the individuals in the room. All participants could see which items were consistently ranked as high-priority challenges, and which received wide-ranging rankings. Another screen displayed all the challenges and all their individual scores (e.g., Challenge "A" received three 2's, six 5's, four 8's, and so on).

When all these results are known to the participants, the group may be ready to determine which challenges warrant the highest priority. If there is wide disparity, they may decide that more dialogue is required before a rational consensus can be reached.

Relative ranking with EMS. The prioritization module of Consensus Builder described above allows participants to rank each item independently and then prioritize them based on the rankings received. With relative ranking, participants go through multiple steps to make direct comparisons of items, ranking them against each other. Relative ranking is very useful because it forces participants to make clear decisions about what is really important, but the process can be confusing when applied in large groups, and the results difficult to tabulate. A new Consensus Builder module makes it possible to control the process electronically.

In the demonstration the participants were asked to break into small groups and discuss criteria to be considered when selecting a new word processing system. Upon reconvening, the participants suggested four criteria, each of which were posted on the flipchart and in the computer as they were during the first demonstration.

Criterion "A" and Criterion "B" appeared on the screen, and the participants were asked to choose the one they thought was more important. Those voting for "A" pressed any key on the top two rows of the keypad, and those voting for 'B" pressed any key on the bottom two rows. When the votes were locked in, Criterion "C" and Criterion "D" appeared on-screen, and voting took place in the same way. With this done, "A" was compared to "C," then "B" to "C," and so on, until each criterion had been compared to each of the others. In total, six rounds of voting took place.

When the voting was complete, the overall results appeared in percentages on-screen. For instance, Criterion "A" was selected 78 percent of the time it appeared as an option, and Criterion "B" was selected 29 percent of the time it was offered as an option. In other screens, the participants viewed the outcomes from various perspectives; for instance, from a look at individual rankings, they saw that everyone in the room selected Criterion "A" at least once, and that one person in the room selected Criterion "A" every time it appeared as an option. By viewing the detailed results of the relative ranking process, participants gain more clarity about what the results mean.

Meeting evaluation. Feedback gathered at the end of a meeting is always useful in gauging success or planning future meetings. With EMS, the tools for collecting immediate feedback are at hand. The presenters demonstrated by asking one yes/no question and by asking participants to rank two statements from 1 to 5. The participants used their keypads to respond, and the responses were tallied immediately. Depending on circumstances, the meeting leader may or may not choose to share the results.

Discussion

System Capacity

Asked how many keypads can operate via a single receiver, Mr. Mintz responded that he does not know precisely how many keypads one receiver can accommodate. He has, however, used one receiver to facilitate meetings attended by 150 people.

Control of Voting

Several questions were asked concerning how voting is controlled, especially when people enter or leave a meeting in progress. The presenters explained that each meeting participant is issued one keypad, which they register at the start of a meeting by pressing a designated key. The system is usually programmed to allow only one vote per keypad. Once a key is pressed, a participant's vote is "locked in," and once all votes are locked in the vote can be tallied. In cases where someone does not vote, the facilitator can override the system and instruct it to tally the votes received.

It is mildly disruptive when a participant enters a meeting late or leaves early; however, a few keystrokes are all that is needed to adjust the computer program. Knowledge that EMS is to be employed tends to make people show up on time.

Meeting Subgroups

In response to queries, the presenters indicated that it is possible to break a large meeting into as many as five subgroups and as many as five different ways (e.g., sex, age, position, party affiliation, race, religion). It is not possible, however, to subdivide a subgroup (i.e., a group can be divided by age and by sex, but a particular age group cannot be further divided by sex).

Value of EMS in Collecting Data

One participant questioned the value of EMS as a data collection tool. Other tools, such as the Internet, might be more cost-effective. The presenters agreed. If the only goal is to collect data, EMS is probably not the right choice. The value of EMS lies in its ability both to collect data and to promote meaningful dialogue.

EMS and the General Accounting Office

Asked how EMS is being employed at GAO, Dr. Lehrer responded that it is being tested now. GAO is employing EMS as an aid to groups who are testing software, and it has been used to facilitate selected executive meetings. GAO does not own its own system at this time.

Keypad vs. Keyboard

A participant noted that keyboard systems have an advantage over keypads in that participants can use the keyboard to brainstorm ideas. Yet the keypad has its own advantages, i.e., it is more portable, and it can accommodate large groups of people more economically.

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Concept to Live Interactive Television—The Customs Experience

Wesley Fue, U.S. Customs Service

Session Overview

The Customs Service began a satellite teletraining and video conferencing distance learning program a few years ago to offer value-added training to a diverse work force of 19,000 employees. Mr. Fue, Station Manager, Glynco, reviewed how the program has evolved over the last five years under the Office of Information and Technology User Support Services distance learning team, and shared some lessons learned and secrets for success.

Background

The Customs Service is a law enforcement agency under the Department of Treasury with 19,000 employees who enforce more than 2,000 laws and 600 statutes that have to do with trade and revenue compliance and enforcement. The work force is comprised of about 9,000 inspectors, 700 special agents, import specialists who vary from 1 to 800 specialists at one of the Customs' 400 ports, pilots who serve as air branch interdiction officers, an audit branch, and numerous types of support workers including finance, human resources, and training personnel. It is a diverse work force with special and unique needs, but continuous training is not part of the culture. That is the single biggest obstacle the distance learning initiative has had to surmount.

Evolution of the Program

The service's training budget is about $10 million per year (less than one percent of Customs' total budget), but 70 percent of this is spent on travel to bring employees to the Customs Service Academy and other Customs Service facilities for basic training. Originally the distance learning initiative was conceived of as a way to reduce travel expenditures. But travel is still about 70 percent of the training budget, because Customs found that in-residence core training is still essential. The distance learning program has allowed for the addition of specific, value-added and advanced training for employees in all functions. Last year the Customs satellite training initiative delivered 150 hours of programming, the most hours per year to date.

Staff. The staff of the distance learning team has grown from its initial composition of two, to the team leader, Mr. Fue (who produces and directs), two other producer/directors, a videoconferencing expert, and three contractors who are responsible for lighting and camera and also are evolving into producers and directors. In addition to these employees dedicated to distance learning, others are temporarily assigned to distance learning projects as needed.

Video services. Customs prepares some original video, but the focus is on satellite training. However the team often shoots video of the live telecast and sends it out to individuals who request it.

Video conferencing. Customs uses video conferencing capabilities more for conferencing purposes than for instructional purposes. The system is a V-Tel system that has paid for itself three times over. Some video conferencing has been between Customs employees and sister agencies in the United Kingdom. Video conferencing facilities are located at Customs headquarters, Ronald Reagan Building, Washington, D.C.; at the Customs Service Academy and the Federal Law Enforcement Training Center in Glynco, Georgia; in Indianapolis, Indiana; in Newington, Virginia; and at SAC in New York City.

Satellite programming. Programming for the satellite teletraining has evolved from pure information delivered via a subject matter expert to some skill-based training. For instance, air operations is now teaching certain flight techniques over the satellite. Soft skill training on topics such as integrity awareness, bloodborne pathogens, and AIDS in the work force has also been delivered over the satellite network.

Implementation Issues

Preparing the experts. Education and marketing to the customer base still takes a lot of the distance learning team's energy. Subject matter experts (SMEs) have to be convinced that the training is effective for their purposes and then educated about how to deliver their message via satellite. Part of the job of the distance learning team is to educate SMEs about how to make the training entertaining and interesting. Every SME is assigned a producer and a production team who help with this challenge. The distance learning team's primary concern is not course design, but rather that what is presented is visually interesting and entertaining enough so the audience does not lose interest.

Broadcast facilities. Broadcast facilities for satellite teletraining are located at Customs headquarters in the Ronald Reagan Building in Washington, D.C.; in Glynco, Georgia at the Customs Service Academy and the Federal Law Enforcement Training Center; and at PBS affiliate WFYI Television in Indianapolis, Indiana.

Site coordinators. Site coordinators for the 80 downlink sites (50 funded by the distance learning team and 30 funded by the local port directors) are inspectors, special agents, training officers, or support people. Some have this only as a collateral duty, others have been with the program since the first day. While these individuals are key to the success of the program, one of the problems is that some of them do not see tracking the training as their responsibility.

A Customs help desk allows site coordinators to get any problems taken care of. The help desk is run by Customs. Actual repairs to equipment are done via contract. Customs sends a monthly satellite programming guide via E-mail, cc:Mail, and hard copy, which site coordinators can post in various places in the port.

Sharing resources. Customs is marketing its expertise to sister Federal agencies such as the U.S. Marshal Service, the Immigration and Naturalization Service, and the General Service Administration's enforcement arm. The Federal Law Enforcement Training Center, where the Customs Service Academy in Georgia is located, supports 70 agencies including Fish and

Wildlife, Customs, the Border Patrol, and the IRS. Customs works in partnership with the Center and is now charging for its services in putting on programs for other agencies.

System Costs

The satellite system cost $1.6 million. Of that, $1.3 million went to installation of the downlinks, and $300,000 went to build the production facility in Georgia, which was accomplished in partnership with the Federal Law Enforcement Training Center. The installation of downlinks was outsourced.

Discussion

Broadcast Audience Size

A participant asked how many people can receive the satellite training at one time. Mr. Fue replied that the training has been delivered to the entire Customs work force of 19,000 employees; however, the largest audience for a single broadcast was 700 people, and the average audience is closer to 20 or 30 people.

Extent of Programming

Another participant asked how much programming is done and in what time slots. Mr. Fue said in a month's time the distance learning team will produce 15 to 20 hours of programming. This includes programs in Indianapolis, Washington, and Glynco.

In response to a question about the length of the longest show, Mr. Fue said he had delivered a series of four-hour shows once, but the average show is just over an hour long.

Viewers

Mr. Fue said in fiscal year 1996 Customs recorded 60,000 viewings, including videotapes, but the distance learning team knows this estimate is far too conservative because many of the site coordinators do not track viewing numbers well.

Demonstration Video

The audience then watched an 11-minute video that illustrated some of the approaches of the various presenters, including using humor both to make points clear and to lighten the effect of the "talking head."

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Building a Sound Business Case for Technology-Supported Learning: Lessons Learned from the Department of Energy

Tanya Luckett, Department of Energy
Robert E. Richards, Ph.D., Lockheed Martin

Session Overview

Four years ago the Department of Energy (DOE) decided to consider the potential benefits that might be achieved by converting significant portions of the agency's training to technology-supported learning programs. As a first step, DOE created a detailed study of the available technology options. Two years later, in order to develop information that agency leadership could take to Congress to justify the capital equipment costs for technology-supported learning, the agency created the required business case, *Technology-Supported Learning Business Case, 1997*.

In this presentation, Dr. Richards described the reasoning and process for developing the business case, as well as the results obtained. While the DOE business case has not yet been presented to Congress, it can serve as a useful model for other agencies beginning to build their own business cases.

Background. In creating the initial study and then in building the business case, the term "technology-supported learning" was used because it encompasses all of the media considered:

- Interactive video teletraining (IVT)
- Multimedia courses (including computer based training (CBT), simulation, and hyper-linked reference documents)
- Net-based or Web-enabled delivery

The term "distance learning" was not used to represent all the technologies considered, because to many within DOE, it is synonymous with IVT.

Dr. Richards estimated that the business case development effort required about a year. Several thousands of person-hours were spent on the 1997 study—enough to have created a significant amount of multimedia training, he noted. Some very positive inertia was developed. It is commonly felt that spending this sizable amount of time will have been worth it if the current technology-supported learning program continues to move forward in a Corporate direction.

Business Case Development

SIM methodology. The development of the business case was a joint effort between training development and information resources management communities. The major effort in data gathering and analysis for the business case was performed using the Strategic Information

Management (SIM) methodology in three successive multi-day workshops held at different locations across the country. Department-wide participation included program offices, field offices, and contractor representatives.

The information resources management staff had previous experience with the SIM methodology, and were more comfortable with it than were the training staff. Ultimately it was agreed that this method—comparing the *status quo* and the desired outcome and focusing on how to close the gap between them—is perhaps better suited for information resources management tasks than training analysis tasks; nonetheless the structured approach did successfully see the staff through the development process. Dr. Richards suggested that the process, which also made use of groupware to capture and catalog participant input, can easily get off-track and to be most efficient must be expertly facilitated and focused on very clear objectives.

Overall approach. The overall approach of the business case analysis was to capture the current training delivery baseline, and then to compare the costs and benefits that could be expected if the baseline approach were continued into the future with the costs and benefits that could be expected under several alternative technology-supported learning scenarios. Dr. Richards noted that the accountant on the project used the industry standard practice of considering costs and benefits for a five-year period only. This is a long enough period of time to realize benefits but not so long-term as to plan too far beyond current realities.

Focusing the approach. In order to keep the analysis manageable, the business case focused on 50 of DOE's 150 sites, each of which had at least 300 employees, and which, together, accounted for 90 percent of the DOE population.

DOE had, at the time the business case analysis began, about 130,000 employees. The team identified more than 12,000 courses that were offered to these employees over the course of several years. Approximately 85 percent of these were offered in the classroom, with the remaining 15 percent offered using other, primarily technology-supported, methods.

To create the business case, DOE staff decided to focus on those courses where there was the greatest potential to realize financial benefits from a technology-supported approach—generally "cross-cutting" courses that were required by large numbers of people in a variety of locations across multiple programs and offices. While the team acknowledged that some low-volume site-specific skills and competencies to be mastered might be extremely well suited instructionally to presentation by computer-enabled methods such as simulations, courses were not included in the study that did not involve significant potential for cost savings. In the end, for purposes of the business case, the team looked at the implications that a new technology-supported strategy would have for a set of 150 courses that were each taken by an average of 3,000 students.

The *Status Quo*. Focusing on the selected courses, the team looked at the cost implications of current delivery methods. This analysis revealed some unexpected findings:

- *Current data did not reflect the significant travel expenditures expected.* This was assessed to be partially due to the fact that DOE had already suffered significant cuts (30 to 50 percent) to travel budgets, and partially due to the systems used to account

for training travel. As a result, expected cost savings from decreased travel with a technology-supported strategy are, on the books, less than might fairly be attributed to a change in delivery methods.

- *Significant technology-supported learning was already occurring, but only a fraction of the fiscal benefit that technology can provide was able to be realized within the existing training infrastructure*. Across the agency there was far too little sharing, almost no standardization, and great redundancy both in course content and in the application of technology. Multiple authoring tools were in use, both Macintosh and PC platforms were being used, and the agency was using both digital and analog satellite transmission. No consistent methodology was being used to select courses for technology-supported learning.

Alternative Scenarios. The team compared the benefit-cost ratio for the *status quo* with that for several alternative scenarios. These alternative scenarios included approaches optimizing key technologies individually (satellite based, computer based, and Web based), as well as a scenario that involved using a combination of these technologies. Optimizing for the different technologies was limited by a number of factors, however.

Optimizing based on Web-enabled delivery was difficult to envision two years ago when the analysis was performed, because the Web was still far from being able to deliver the potential it was believed it would ultimately offer. Nonetheless, downloading CBT from a Web site was a combination solution available even then. Another combined solution involved requiring students coming to an IVT course to do some CBT lessons or pre-reading on the Web before attending class.

Having just one digital uplink facility for interactive television (ITV) transmissions was a limiting factor in the extent of reliance on this medium. The team did not include increased capacity in their study, because they viewed the costs of adding this capacity to be prohibitive, although partnering with other government agencies to broadcast courses using their facilities was considered.

All scenarios presumed efficient implementation from a Corporate perspective (i.e., optimal sharing of new or converted courses and standardization of delivery methods), as well as the creation of uniform, high-quality courses with a competency focus. All scenarios allowed for the development of an infrastructure to enable online searching for "cross-cutting" courses, online registration, and potentially actually taking the courses and/or tests online. This type of "one-stop shopping" is presently being experimented with extensively at various DOE sites.

The cost and benefit assumptions. In order to perform the comparisons in the business case, the team needed to specify hundreds of assumptions about costs and benefits and related factors. Specifying these assumptions was not always easy. For example, the costs to create computer-enabled training can range from $2,000 a seat-hour, or less for hyperlinked information, to in excess of $200,000 for sophisticated simulations; coming up with a single assumption factor was difficult. As another example, it was anticipated that the ability to take courses when needed and to use courseware for refresher purposes would result in better performance or safer practices; it

was necessary to place a value on this anticipated benefit. Further, when quantifying assumptions about cost factors over time, it is important to have accountants involved, Dr. Richards pointed out.

Examples of specific assumptions used include the following:

- To calculate the benefits of reduced student learning time it was necessary to make an assumption about the loaded salary costs of an employee hour. The rate used, $35 per hour, was based on a GAO-derived number which was believed by the team to be conservatively low for the DOE population as a whole.
- To quantify benefits, it was assumed that the improved quality of courses would result in a 15 to 20 percent improvement in student test scores.
- A 35 percent reduction in student learning time was assumed for the optimized scenarios vs. the *status quo*.
- The assumed discount rate (for net present value calculations) was 3.1 percent per year.
- The team assumed only a modest decrease in instructional staff time with a conversion to technology-supported training, especially with ITV where local facilitators would often be required.
- Modified commercial off-the-shelf computer based courses can cost between 30 and 40 percent less than custom-developed CBT.

The spreadsheets used to calculate the cost-benefit ratios include all of the assumptions that DOE made in this study. Dr. Richards indicated that these spreadsheets could be made available to other agencies.

Business Case Findings

The bottom line for the analysis was that the optimal technology-supported learning strategy would result, conservatively, in a net savings of $66 million over five years, with a benefit-to-cost ratio of three to one. The savings, which were expected to double every year from the first through the fifth, were expected to be realized primarily in the area of reduced student learning time, with additional savings (but less than initially expected) realized from reduced travel costs, and modest savings from reduced instructional staff costs. Since the labor cost factors used to calculate the benefits of reduced student learning time were low, it is judged that the $66 million estimate is quite conservative; savings could, in fact, be more than twice that, Dr. Richards said.

One of the participants pointed out that the increase anticipated over the first five years does not continue indefinitely; the increase in savings eventually peaks, as costs to replace equipment and update courses are required. The model used in the DOE cost-benefit analysis takes upgrading the courseware into account but did not consider major hardware upgrade costs.

In contrast with the potential benefits of a streamlined curriculum with reductions in redundancy and optimization of technology, continuing the current "stove-piped" implementation of technology based training was anticipated to result in only a net savings of $2 million over traditional training methods over the same five-year period. The gross savings were projected to

be considerably greater than $2 million, but so were the costs of redundant and inefficient development and implementation.

Outcome of the Business Case

Pressure to reduce the size of the Department has resulted in an environment in which training budgets and overall Department budgets have been cut. While the business case has been presented to Department leadership, and the investment in technology-supported learning (implemented with a Corporate rather than a haphazard approach) has been embraced in concept, DOE was not, in FY97 or FY98, in an appropriate position either to request a capital equipment line item from Congress or to commit funding. Preparation for specific budget line-items for outyears is currently underway, as is an effort to update the key numbers within the business case. Regardless of the lack of immediate success in obtaining funding, many of those involved in creating the business case hold that there is a much more widespread understanding within DOE of the benefits of using technology to support learning, especially within a Corporate approach to training. An ongoing assessment is also indicating that the Department is starting to see an increase in voluntary cooperation among elements of the organization and in the use of technology.

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Financial Management System: Performance, Education, and Training Support (PETS)

Rick Sales, Department of Veterans Affairs
Tracy Terrell, WordPro, Inc.

Session Overview

This session addressed the development and delivery of "just-in-time" performance, education, and training support (PETS) to employees of the Department of Veterans Affairs (VA) via wide-area and local Intranets. The session introduced PETS concepts and examined how PETS addressed critical training and performance requirements for a legacy financial management system (FMS).

Background

Two years ago, Mr. Sales noted, the VA installed nationwide a brand-new FMS, a mainframe system that had about 2,000 users. To train these users, the VA adopted a train-the-trainer approach. A contractor was hired to provide classroom training to three individuals from every site. These students were then expected to go back to their sites and train their fellow workers.

Training the trainers was expensive and time-consuming—the course took two weeks. There was limited class space for the training. Although the training focused on job performance, the training was conducted out of the job context. In two weeks of training, the learners suffered from information overload, and the rate of retention of this information from the classroom setting was disappointingly low.

The VA sent out two copies of thick procedure guides to every station; these guides had to be shared, often by a number of people. Page changes were done by sending out replacement pages, and someone at the station had to be in charge of collating and tracking those changes, and subsequently updating the guides, a difficult process.

Eventually, Mr. Sales noted, the VA started receiving complaints from their employees that they did not know the process, were confused about the technology, and did not have enough opportunities to learn by performing tasks regularly with this more advanced FMS system. A lot of the staff could not attend the training in the first place. With any new system, there are inevitably data entry rejects; the error messages for the new mainframe were not very descriptive of how errors occurred, however; consequently users had difficulty correcting those rejects.

The PETS Solution

Contrary to the traditional training model of **teaching** people how to do their job, the aim of PETS is to help people **do** their jobs, by giving them the information they need while they are at work. With the PETS model, the training is right in the employee's computer, accessible right at

the desktop. Unlike traditional training, which is completed prior to job performance, with PETS, users are provided with support in real time with their job performance. In traditional training, the educator controls the teaching sequence; with PETS, the user controls the training experience. The evaluation of traditional training is unavoidably subjective; evaluation of PETS's effectiveness, however, is based upon a more objective criterion: how well its users are doing their jobs.

The catalysts for turning to PETS were that training budgets were shrinking, while at the same time technologies were becoming increasingly available.

Features. Some of the properties of PETS include—

- Internet links to the procedure guides; everyone with Internet connections now has access to the manual, eliminating the need for the bulky hard copies
- Learning simulations and tutorial that are built into the software
- On-screen "hot" buttons that provide context-sensitive help
- Error-resolution support: the approximately 6,000 error messages possible with the system were categorized and vetted, with the ones that occur most frequently described more clearly
- A glossary and a frequently asked questions (FAQ) section.

Benefits. Mr. Sales reviewed some of the benefits of PETS:

- Reduced need for classroom instruction, and all its attendant disadvantages
- Reduced training time requirements and decreased distribution of paper
- Improved work efficiency and accuracy
- Enhanced worker satisfaction.

How PETS Works

Ms. Terrell demonstrated PETS in operation. On every required field, there is a context-sensitive help link. A little-known feature in the Dynacom communications package on the mainframe allowed project staff to create these help links. The online FAQ is derived from the frequently asked questions that had been called in to the help desk prior to PETS development. The glossary is as comprehensive as possible.

The typical FMS screen has a "flashpad" at the bottom, with icons that can automatically launch procedure guides, a notepad, a calculator function, and a help guide. A "checkmark" icon launches the data base of error code descriptions. A sub-allotment screen for the FMS provides a user with definitions of fields, and launches a help guide for specific fields without leaving the FMS system, allowing users to get help when they need it. In developing PETS, Ms. Terrell observed, one of the findings was that users would like to have had this performance support feature earlier. PETS has both field-specific and screen-specific help features.

The table of contents has links to the FAQ for particular subsystems. The searches are both word- and document-sensitive. There is a tutorial provided for each section of the budget data entry: it gives the background and rationale behind the FMS, and describes PETS and navigating

through it. The FMS overview has an audio component, with a narrator who talks the user through the tutorial. PETS is on the Internet, and is available to be downloaded locally.

Lessons Learned

Development team. Ms. Terrell observed that, in developing PETS, it was necessary to involve several different disciplines:

- Software engineers to delineate the capabilities and limitations of the Dynacom system
- A performance support specialist who understood the methodology of developing a performance support system from the requirements analysis stage, through development and testing, to field implementation
- A trainer: someone with an instructional design or education background, who understood how people learn
- A media specialist who had good technical writing skills, who understood how to write to an audience, and who could deconstruct the procedure guide and adapt it to the PETS format.

Technology limitations. During development, Mr. Sales continued, a technology problem was encountered: no one on the development team had experience using a crucial piece of Dynacom that used its script language to develop the "hot" buttons. The requirement was to provide a Windows-type functionality, with help features, with the mainframe running in the background. The development team, however, ran too far ahead of that technology's evolution: the Dynacom scripting language, it was learned, had a limitation on how many "hot" buttons it could accommodate, and this limitation was not removed.

As a result of this technology limitation, Mr. Sales said, the development of PETS was halted after the development of only three modules. Since the support tools can no longer be provided using the scripting language embedded in the Dynacom technology, it has become necessary to find another way to provide access to these tools.

As a result of this experience, Mr. Sales suggested that developers should hesitate before committing to a technology (such as the Dynacom technology) that is on the cutting edge. Instead, they should wait for a technology to mature before developing applications for it. Then, as a new system is prepared and installed, developers should build in electronic production support concurrently.

Alternative approach. Efforts are now underway to extract the Internet link, error listing, tutorial, and glossary pieces out of the FMS, and couple them to another, and brand new, Windows-based product. This Windows-based application will run on top of the FMS mainframe, and will be considerably more user-friendly and will accommodate more online help. The additional investment to develop this new product will pay for itself, Mr. Sales observed, as the expanded online help will substantially reduce the need for classroom-based training.

Conclusion

When the new performance support tools are in place, they are expected to reduce errors, as well as the need for expensive, time-consuming, and relatively inefficient classroom-based training. The tools will make employees more productive on the spot, and as a natural consequence, they will bring more enthusiasm to the product.

Discussion

Data Integrity

An attendee from the Postal Service is developing a similar product: a mainframe without a graphical interface. Data integrity is a large issue with her organization.

Time Line

In responding to a question on the development time line, Mr. Sales indicated that the assessment of FMS training began in January of 1995, and it took six months to develop PETS. Given how complex the effort was and the length of the learning curve, Mr. Sales observed, the development process was not so long. Ms. Terrell added that it took about eight months, from the time the contract was awarded, to develop the three modules on creating budgets, a general ledger, and payments.

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Harnessing the Power of the Web for Training

Norline Depeiza, Defense Acquisition University
Sharon Fisher, Human Technology, Inc.

Session Overview

Introduction

The Defense Acquisition University (DAU) is responsible for delivering training to over 400,000 government employees. More than 70 courses are being converted from current delivery methods to delivery over the Web. This session presented the process and lessons learned in developing two of the first courses for Web based delivery, focusing on the *Simplified Acquisition Procedures* (*SAP*) course.

The presentation began with an overview of important considerations in the development of Web based training, provided by Ms. Fisher. This was followed by a description of the *SAP* course, presented by Ms. Depeiza. A subsequent discussion led by Ms. Fisher addressed the technical considerations in developing and implementing the *SAP* course as well as the alternative development approach being used to develop the larger *Information Systems Acquisition* course. The session concluded with a narrated courseware demonstration that highlighted key screens and features of the *SAP* course.

Initial Considerations

Web based training has specialized requirements that can affect the development considerably. The following considerations should be addressed very early on in the development process:

- *User hardware.* It is critical to establish the minimum specifications for end user communications and computer equipment, and to find out whether this is expected to change over time.
- *Browsers.* It is important to understand what browser or browsers the users will be using. At least at this time, Web based materials are quite browser-dependent. A cross-browser product has many more technical challenges than a product that will be accessed with one prescribed browser, and will require more development time.
- *Open vs. closed site.* It is important to consider security and other issues and determine whether the site will be open to anyone or made available only to a select population. In addition to security/content issues, the more people who have access to a Web site, the more management the site will require. Further, if instructor support is to be provided to Web students, the student-to-faculty ratio needs to be considered.
- *Host server(s).* It is imperative that the systems or network administrator and Web master (whoever manages the Web site) be involved from the beginning. These people are critical partners in the process. Although they may not be familiar with the requirements of distance learning, they will be responsible for installing and

implementing the software within the existing server environment, and will need to troubleshoot problems that may arise.

- *Accessibility.* It is important to consider accessibility issues in keeping with the Americans with Disabilities Act. Reasonable accommodations for disabled users, for example, the ability to operate without a mouse, need to be considered at the earliest phase.
- *Maintenance.* Web based training allows feedback and tracking data to be generated constantly, and allows links to be included to other sites. This in turn creates a constant need for maintenance to manage and clean up the data, to update and link URLs, and so on. It is important to establish up front where that responsibility will lie.
- *Usage data.* If user record keeping and tracking are necessary, these should be designed in from the beginning.
- *Copyrights.* It is important to be sure to obtain permission to use any copyrighted material ahead of time. Abuse is too frequent, and copyright owners are searching the Web for infringements.

Analysis and Instructional Design Considerations

Design of Web based training requires excellence in basic instructional analysis and design, as well as some special considerations not required for more conventional training delivery methods. Of particular importance are the following considerations:

- Focus on the task/learning requirements—the desired performance outcomes and the necessary skills.
- Consider and capture key assumptions about the target audience. A new consideration related to Web delivery is whether or not users know how to use a browser. It remains important to know the users' learning styles. It is important to consider how users may react to Web based training, and whether or not they will be motivated to complete training presented this way.
- Determine what level of learner interaction is needed or desired.
- Specify what types of testing are required, whether certification is a requirement, and whether security of testing is an issue.
- Consider what features of the Web environment you want to take advantage of in order to provide continuous learning support and faculty-student interaction.
- Consider the faculty requirements implied by the support you want to provide, and whether (and how) you will maintain necessary ongoing instructor support.

Capabilities of Web Based Training

People learn by doing, seeing, and through correcting failure. These all require interaction. While designers know how to accommodate interaction needs in multimedia, they are just learning how to use the Web based training environment.

The Web provides a large range of options for providing training and performance support, and for enabling interaction and feedback and continuous learning support. It is important to

understand these options and to design an overall program that provides the capabilities that will effectively support the desired learning and performance.

Training presentation options on the Web. The Web offers a continuum of information presentation options, from simple information delivery to full-blown, highly interactive courses:

- *Information delivery.* At the lowest level, the Web can be used to provide access to reference information, like a library. Hyperlinks and search capabilities are easily added with HTML and JAVA. People can learn from online references, and there is full learner control, but there is no other interaction. These types of sites are very easy to create and to operate.
- *Resource-based learning.* At the next level, the Web can be used to provide easy access to a number of small "snippets" of information to support performance. These small modules, which may take between 5 and 10 minutes to complete, can include brief interactive sessions, small assessments, helpful checklists, etc. These are also created with HTML and JAVA. The Web can provide a good structure for organizing and providing quick access to these modules, which can be used for development or enrichment. While these types of resources can support performance, they do not support the building of significant skills.
- *Web based lessons.* At the highest level, the Web can be used to deliver large, complex, fully interactive courses such as the *Simplified Acquisition Procedures* course created for the Defense Acquisition University. There are two technical approaches to creating these courses: 1) using CBT authoring languages (such as Authorware) with plug-ins (such as Shockwave) that stream the traditional CBT courseware through the Web a little at a time; and 2) creating native HTML and JAVA courseware, that does not require a plug-in. Each choice brings its own challenges, which are described later.

Options for further interaction and continuous learning support. In addition to providing learning opportunities and courseware in the traditional CBT sense, the Web provides extensive additional options for interaction, feedback, continuous learning, and long-term performance support. These capabilities include the following:

- Updates can be provided for students in several ways. Instructors can post new information or updates at the Web site home page, or student E-mail addresses can be retained in a database and follow-up information can be E-mailed to all who have completed a course.
- Links can be offered to other Web sites.
- Critical reference manuals can be put online and made accessible from the training.
- Chat sessions can be created for student-instructor discussions.
- Students can be directed to complete exercises and submit them by E-mail to an instructor, who can respond by E-mail as well.
- Testing and scoring can be included online, along with full data tracking.
- Evaluation data and student usage and completion data can be maintained and accessed by instructors or managers, allowing instructors to monitor student progress if they wish.
- Course registration can be completed online.

- Student status and place in a lesson can be maintained to enable the student to know where he or she is, and to allow the student to leave and later return to a lesson at the same place. (This is an important feature for delivery of large courses, since the optimal Web based interaction period is about 20 minutes.)
- Students who are having difficulty can request individual assistance from instructors by E-mail, and can receive assistance in an individualized chat room session or through E-mail or other correspondence.

The DAU *Simplified Acquisition Procedures* (*SAP*) Course

Audience. The Web based *SAP* course is a continuing education course created for a very large audience of more than 25,000, consisting of both new acquisition personnel and previously certified acquisition personnel who need to be informed of changes. The course consists of nine lessons. In the implementation of this course, DAU has chosen to take advantage of many of the options for student support beyond the simple interaction with the courseware.

Interface. The lesson interface simulates an office environment, with on-screen "to-do" lists substituting for traditional menus. The interface includes an E-mail system to simulate real world occurrences, situations, decisions, responses, and actions. Students respond to memos, E-mail, and phone calls to complete simulated tasks and build skills. Instructors review and respond to student E-mail.

Registration. Registration occurs at the Web site. When students first register, they are asked if they are Department of Defense (DoD) users. Non-DoD users can download the course, but will not have access to instructors, chat rooms, other students, and other interactive features. The beginning of the course also provides a streamlined process for enabling students to download the Shockwave plug-in that is necessary to enable the browser to display the Authorware-developed courseware.

Completion paths. The first lesson is mandatory. The remainder of the course is very self-directed. Users must complete a mastery test to obtain completion credit. Once they have completed the first lesson, users can then decide to take the mastery test or whether to complete the rest of the course. Students are given three attempts to complete each test. When a user has completed the course successfully, an E-mail message is sent to the user's supervisor, and a certificate of completion is sent to the student.

Additional resources. In response to requests from the target audience, access is provided to a number of additional resources directly from the course. Include are the Federal Acquisition Regulations (FAR) as well as access to a list of frequently asked questions, important GSA lists, and a student chat room. DAU feels that one of the strengths of the course is the ability to provide resources, online references, and continual learning support, which enable the learners to control their work environments and improve their performance.

The Course Development Experience

To create the *SAP* course, DAU created Authorware lessons that are "Shockwaved" for Web delivery and integrated with an Oracle database containing student information. Ms. Fisher likened the Authorware courses to the eggs, and indicated the challenge of creating a "carton" for these eggs to make sure they are available when needed and to protect them from damage. "Middleware" is used to manage the presentation of courses and the storage and retrieval of information in the Oracle database.

Bandwidth concerns. A key consideration in this first course was the issue of bandwidth—the ability to transmit the course data to the users in an acceptable amount of time. Concerns about file size were managed in a number of ways. Efficient coding was used to keep file size down, a small tile was created and repeated to create the background, graphics were placed into a single file that was downloaded ahead of time (and that could be deleted after completion of the course), and graphics were reused whenever possible.

User experience. A number of common problems arose with the browsers on user computers. To provide support for these problems and for other user problems (and anxieties) with the Web based delivery, DAU provided guidelines to enable instructors to answer common technical questions; established a 24-hour help desk (which is now maintained by the National Technical Information Service (NTIS)); and provided users with phone numbers of the training staff. In addition, DAU provided information and coaching to users by E-mail.

Costs. In response to a question from an attendee, Ms. Fisher indicated that the nine CBT lessons cost between $100,000 and $150,000 to create, and that the creation of the Web infrastructure (the "egg carton") cost an additional $100,000. This infrastructure is reusable, but can only support 50 courses, and cannot easily be moved to new platforms and servers.

Development of the next course. Based in part on the experience with the SAP course, and to meet other needs, DAU is using a different development strategy for the 20-hour *Information Systems Acquisition* course. Using Authorware and Shockwave is a solution designed to fit an old technology to a new environment. There are problems inherent in using a plug-in in a multi-browser environment, such as that of DAU students. Therefore, in this development effort, the courses are being created directly in HTML and JAVA. This should decrease the browser dependency somewhat, and should also have the added benefit of creating reusable objects—in essence creating specialized Web based courseware tools. (Reusing Authorware courses is not a straightforward process.)

Creating the course directly on the Web has also met other DAU needs. The course design document was developed online and posted on the Web site, and a questionnaire posted on the Web site was used to capture comments from a wide audience of subject matter experts from around the world who helped to validate and evaluate the content. Once the input was obtained, the team reviewed all the comments to identify necessary changes, and then went on to begin to develop the storyboards.

Success Factors

The following list summarizes the key guidelines for successful development of Web based training provided in this session:

- Know why you want to use the Web.
- Start simple.
- Use existing resources and links when possible.
- Test your approach.
- Provide help-desk support.
- Plan for maintenance.

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Implementation of Distance Learning: Critical Factors

Lenora Peters Gant, Ph.D., Defense Intelligence Agency

Session Overview

Introduction

As a warm-up exercise, Dr. Gant asked the attendees to try four multiple-choice trivia questions related to the history of distance learning (DL) and then discuss their choices with the person sitting next to them. Reviewing the correct answers, she noted that DL is not all that new. Although the term "distance learning" was coined by the Department of Education in 1983, correspondence courses available in the early 1800s are considered the earliest examples of distance education in this country. Pioneers in the field, such as the founder of the Chautauqua program, were noted, as were several corporations that offered DL earlier this century.

Indicators of Success and Quality

Dr. Gant then challenged the attendees to suggest three critical factors in the successful organization of a quality DL program. After hearing their ideas, she confirmed that from her experience the keys to success are (1) a collective (team) effort by all concerned, (2) a competency- or performance-based curriculum, and (3) cost-effectiveness. Successful training starts with a plan championed by everyone involved, adheres to standards, and achieves results. In a quality DL program, content is the essential, not hardware. Quality emerges from the content design and layout (including choice of graphics and visuals), the well-trained instructors and facilitators, and the student guidebook or supporting handouts.

To ensure a positive return on investment, technology-based training must be relevant to the mission of the agency (organization). A performance-based DL curriculum emphasizes the knowledge, skills, and abilities that trainees need in their jobs. The agency's investment should be a reasonable one in terms of design/development costs, use of resources, and staffing. And the DL product should be reusable.

Making Distance Learning Happen

Organizations need manpower (subject matter experts and interactive systems design specialists), money, and adequate time to develop quality DL. Dr. Gant noted that the team approach usually allows cost sharing. The team, in turn, faces a set of challenges specific to distance learning, which involve technology standards, interoperability, instructional design, and course implementation.

Focusing on performance-based instructional design, she emphasized that DL courses must be built on sound educational principles, take into account different types of learners and different learning styles, include interaction with the student, and use a consistent format (screens and

graphics) for the content. Modular lessons work well in DL. To illustrate the difficulty of designing graphics for DL modules, Dr. Gant gave the attendees a design exercise to try on their own and then discuss in small groups.

The choice of technology (media) also affects the course design. Dr. Gant described computer based training, CD-ROM training, and Web based training as "stable." Two-way audio and video as well as traditional classroom training were characterized as "static." The latter permit live (spontaneous) interactions with the instructor and/or facilitator.

Distance Learning Using Two-Way Audio and Video

The remainder of the presentation focused on the use of two-way audio and video for distance learning. Turning Defense Intelligence Agency (DIA) standard classroom courses into DL programs involves reconfiguring the lessons, designing appropriate graphics for the medium, preparing student materials, re-training the instructors, and practicing with the technology. DIA has developed graphic design protocols to ensure high-quality graphics. Instructors also follow protocols during their delivery. Dr. Gant acknowledged that the hardest task tends to be re-training the instructors.

Agencies interested in using this particular DL technology must understand that the two-way hardware itself creates distractions for the participants. Background noise levels may be high on some systems, and beeping noises occur as sites sign on or off. Microphone placement can be problematic. If incoming pictures or graphics from distant sites break up, visual quality is erratic. Television monitors sometimes pick up a rotational movement of distant sites.

Dr. Gant presented results from research she conducted using surveys of three focus groups (actual DIA trainees) and her own observations of a fourth group of trainees. The groups were asked to name the core factors of a successful two-way audio and video DL course. She then discussed ten of the factors that surfaced.

The instructor. Training succeeds when the instructor uses the technology properly, engages the trainees in the instruction, varies the questioning techniques, and acts in a professional manner.

The site facilitator. The site facilitator, who may or may not be a subject matter expert, must collaborate fully with the instructor. The facilitator sets up the telecast at least one hour in advance of the start time, troubleshoots the equipment, handles administrative tasks such as taking roll and distributing materials, and willingly accepts other duties as necessary.

Staff development. Because teaching in a traditional classroom is unlike teaching in a DL setting, instructors must receive solid training and practice in interactive television teaching skills. Instructors must learn how to develop and deliver telelectures. DIA has established delivery protocols—for example, how to manage moving cameras, or how to use whiteboards and flip charts effectively. Instructors and facilitators must understand their respective roles and the trainees' perceptions of their demeanor on or off camera.

Interaction. Successful courses involve the trainees. The content should be designed to encourage their participation, and instructors should engage them by asking probing as well as reflective questions. Student guidebooks also facilitate interaction. At DIA, for example, a three-page syllabus for a 40-hour course turned into a 98-page guidebook. Supplemental exercises or reading assignments also stimulate interaction.

The equipment. The instructors and facilitators must be familiar with the correct operating procedures for the equipment. Different components include the master controls on the podium, the ELMO graphics display, the cameras and microphones, and the Codex. The facilitator or some other designated person must be available to troubleshoot when glitches occur. The instructors and facilitators must have backup plans in the event of equipment failures.

Visuals. Interactive television graphics must support the learning objectives. They must be large, clear, and well placed on the screen. Text must be legible at a distance; font size 36 was recommended. DIA includes graphics and visuals in the student guide so that if the two-way video system crashes, training can proceed under the guidance of the facilitator.

The student guide. The student guide provides an outline of the content of the telelecture (including graphics) and doubles as a place to take notes, provided that enough white space is allowed. The guide can also include summaries of important concepts and extra assignments or work-related projects to reinforce the DL course.

Adequate planning time. Instructors need adequate time to learn how to teach using two-way audio and video, prepare their telelectures, practice using the technology, prepare student guides or supporting materials, and coordinate with the site facilitators. DIA courses may involve ten sites with 30 to 70 trainees per site.

A comprehensive evaluation plan. Training succeeds when it includes comprehensive evaluations of the staff development effort, the instructors' performance, the course design and content, the facilitators' performance, and the equipment at each site. The training team and the trainees must appreciate the importance of evaluations and be given time to complete them.

Access. To participate, personnel must have access to DL facilities and access to course descriptions, classifications, and registration instructions. DL succeeds when it matches or augments resident training and saves an agency money by reducing travel costs.

In summary, Dr. Gant emphasized the shift in approach and delivery from the traditional classroom to the two-way audio and video DL environment, particularly the close collaboration of the instructor and the facilitator.

The Future

The essential DL components fit together like a complex jigsaw puzzle. As agencies turn to DL to meet their training needs, decision makers must keep accessibility and transferability in mind. Dr. Gant predicted that the modular format will prove useful and reusable. Stressing that quality

DL programs will be performance-based and results-oriented, she urged attendees and their respective agencies to accept the challenge of new technology and "just do it."

To glimpse the electronic future, attendees saw a short video produced by AT&T depicting a time when people will communicate, learn, and do business via one "smart" integrated system. The story follows a family of three as they go about their personal and professional lives using a voice-activated system that combines the functions of a telephone, television, interactive video, computer, and World Wide Web.

Discussion

SME Buy-In

Several attendees asked how DIA gains the cooperation of the subject matter experts, who in some agencies act like prima donnas, to reconfigure the courses and learn new instructional methods. Dr. Gant explained that because DIA operates within the military command structure, personnel accept decisions and directives from above. That said, DL managers try very hard to establish a team rapport by eliciting ideas from everyone involved, especially the instructors (subject matter experts). The entire process of reconfiguring a course including instructor training can take up to six months. She believes that investing the time to build good relationships and keep communication lines open usually pays off with a good product.

SME Preparation

An attendee commented that in her agency, when subject matter experts go through training and prepare practice lessons, they critique themselves and each other. Dr. Gant agreed that this is a useful strategy for instructors who believe they are without fault. Peer-group critiques can be very instructive. Annual performance appraisals at DIA may include evaluations of the instructors' performance during staff training and during the DL course. Sometimes, incentives are offered for subject matter experts to rework their courses, such as a break from teaching for three months.

Lesson Length

When asked if a four-hour telelecture seemed a "reasonable" length, Dr. Gant said that while it depends on the material, that seemed rather long. At DIA, site facilitators are often consulted when designers/instructors set the baseline number of hours per lecture. Trainee feedback also informs this decision.

Sharing Courses

In response to several inquiries, Dr. Gant promised to find out whether DIA can make unclassified DL courses available to other agencies. Anyone interested should contact her.

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The Federal Acquisition Institute's On-Line University

Gayle L. Messick, Federal Acquisition Institute

Session Overview

Background

Since 1979, the Federal Acquisition Institute (FAI) has worked to foster and promote a professional procurement work force in the Federal government. In addition to other products and services, FAI develops training standards for government-wide acquisition and contracts management personnel, assists colleges and universities in establishing acquisition courses and programs, and develops instructional materials for contract management. The Office of Federal Procurement Policy, Office of Management and Budget, provides for and directs FAI activities. The General Services Administration is the executive agent for the Institute.

In 1997, FAI embarked on a new and ambitious undertaking as it launched the On-Line University. When complete, the FAI On-Line University will bring to the Internet a comprehensive catalog of courses and research material. It will provide training for new and experienced government procurement personnel, helping those who support the ever-changing Federal Acquisition Regulations (FAR) gain and maintain competency. Located at *http://www.gsa.gov/fai,* the university will offer both self-paced and instructor-led courses as well as a library of print and audio resources. It was open for preview at the time of the Government Learning Technology Symposium, with courses scheduled for launch in the spring of 1998.

Gayle L. Messick, Dean of the FAI On-Line University, visited the Symposium to take participants on a guided tour of the new Web "campus." Because the university's objective is to meet the training needs of personnel at all experience levels, she preceded the tour with an exploration of worker needs at varying career stages.

Work Force Concerns, Goals, Needs

Not all training works for all people. Among other factors, training needs vary by experience level, career stage, and personality type. Over time, Ms. Messick has defined four broad categories of learners:

- "Clean slaters" are new to the work force or to an occupation.
- "First timers" may be at any point in their careers, but are performing specific tasks for the first time.
- "Explorers" have had a lot of training, whether formal or informal, and now want to grow in their field. Some choose to take "guided tours," e.g., formal course work; others choose an "unguided" path, e.g., reading, networking, trade shows.
- "Grizzly bears" have well-established careers. They don't want more training, but they need it.

To build a training curriculum that will meet the varied needs of these learners, it is important to know their concerns and their ideals. Ms.
to help them categorize their own stages of learning, and then to identify the concerns and ideals

Learner problems and concerns. After a brief exercise in which the participants identified slaters," "first timers," "explorers," or "grizzlies," the group set out to identify the problems and concerns experienced with training by each category. The "clean

so on. Some of the concerns identified come from the perspective of the learner; others are from the trainer's perspective.

slaters" identified the following problems and concerns:

- Irrelevant training
- Arbitrary cutoffs that prevent workers from taking needed courses
- Limited access to experts
- Insufficient time allowed to attend training
- Overwhelming amount of knowledge/skill to be obtained
- "Mind-blowing" acronyms
- Long hours of sitting and listening in a classroom.

The "first timers" identified the following problems and concerns:

How to make mundane issues sound interesting
The need to train people who do not want to be trained
How to decide what information to include, and what not to include.

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The "explorers" who prefer unguided tours identified the following problems and concerns:

- Where to begin
- How to validate the quality of a training resource
- How to find out what is available.

Expanding on the explorers' viewpoint, two participants indicated a preference for the unguided

other sees value in seeking mentors, whether supervisors or co-workers.

The "grizzlies" identified the following problems and concerns:

Training that does not match on-the-job needs
Regulations that are out of date
Time-consuming, disruptive travel to get to

Expanding on the state of the average grizzly, one participant noted that grizzlies do care about doing their jobs well and welcome relevant training. However, in her experience this group consistently does not get what it needs from training, and they are tired of being taken away from their jobs, homes, and families to attend training that does not help them perform.

A perfect world. In the next exercise, small groups convened to define the "perfect training world" for each of the four stages of employment.

The "clean slaters" described the qualities of their "perfect training world" as follows:

- Relevant training (what the learner needs to know, not what is already known)
- Training delivered at a pace at which learners can learn
- Training that accommodates individual learning styles
- Training available when needed
- Accessible follow-up when needed
- Core and critical competencies identified
- Material available online prior to training
- Mentor and electronic support network.

The "first timers" described the qualities of their "perfect training world" as follows:

- Just-in-time training (modular, with case studies)
- Training offered in many formats (e.g., online, on CD) and available for use at home or in the office
- Training that is specific to current needs.

The "explorers" who prefer guided tours described the qualities of their "perfect training world" as follows:

- All the qualities of "clean slater" and "first timer" training, plus . . .
- Supervisor commitment to training
- Time to identify strengths and weaknesses
- Supervisor guidance along career path
- Individual meetings between supervisor and employee to work toward goals
- Instructors who are subject matter experts
- Learners who take responsibility for their own careers.

The "explorers" who prefer unguided tours described the qualities of their "perfect training world" as follows:

- A living instructional delivery plan, i.e., planned but subject to change
- Mentors to provide guidance
- Reading lists
- Good preliminary overview
- Access to personal notes and observations
- Resources specific to the topics that should be covered.

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  done
- Learner control over what and when to learn.

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The FAI On-Line University will offer a comprehensive array of formal and informal training

presentations, and other online resources will meet the needs of procurement personnel at all stages of employment. The university will help learners plan and establish training roadmaps. It will also track progress through course series, coordinate general acquisition course work with the requirements of individual agencies, and notify registered students when duty changes occur.

Ms. On-Line University following a traditional campus structure. The campus holds 12 features in all—nine "buildings," each of which has a function similar to that

and two kiosks. A click on any of the numbered campus features takes the learner to a new learning opportunity. Descriptions of the features follow.

On his or her first visit to the On-line University, each student registers for classes. Individual log-in names and passwords are established as part of that process. On return

#2. Bookstore.
resource materials.

#3. Career Management Center.
guidance. Here, they will also find help in developing individual training plans. They can also learn about the qualification standards that apply to them and their jobs.

As on any campus, students visit the Student Center for opportunities to network with their classmates, in this case other acquisition professionals. Communication will

interest, for it is here that they will find "Wheel of Fortune" and "Jeopardy" type games designed to keep them apprised of changes in processes or in the FAR.

Administration Building. This page is the main menu for instructor-led course registration

transcripts or update information in their student profiles, and supervisors can use the same

feature to check on the progress of their employees. Individual buttons direct students to the registrar's office, a course catalog, courses by date or by city, and a list of instructors. Personal information housed in the Administration Building will be password protected.

#6. Event Kiosk. The Event Kiosk provides news on FAI events and other announcements. It also provides navigation assistance and additional information on the Web site.

#7. Academic Building. This is the classroom of the future. Instructor-led classes will be conducted in this virtual building. All students entering the Academic building begin their campus careers with the Survival Skills Course, which is actually an introduction to the On-line University and—for those who need it—Web navigation. The course walks students through the process of downloading software and configuring their computers to accommodate the university's features.

#8. New Student Orientation. This page introduces students to the campus learning experience. It also provides a link to the Survival Skills Course. In addition, the building is a starting point for campus tours.

#9. Directory Quick Access. The Directory Quick Access kiosk provides campus directory information and related hyperlinks. It serves as a table of contents for the remainder of the site.

#10. Auditorium. Special events and seminars will take place in the Auditorium. Included will be live lectures and presentations as well as archived versions of past events. Both audio and video events will be held here, and chat sessions will be featured as well.

#11. Library. The Library is the central research location. From here students can link to Web sites and reference materials. The library also contains a virtual exhibit hall, which will feature revolving exhibits. Examples include CBD On-line, List of Excluded Parties, ARNET (virtual library and best practices), GSA Advantage, and Market Research Support Tool (DoD-AR). The Library also provides a link to the archived lectures housed in the Auditorium.

#12. Individual Learning Center. This page holds the main menu for all self-paced learning programs, including COR Mentor and Market Research for Acquisition Officers. A link to the Survival Skills Course, the startup course for all On-line University students, is also provided. Clean slaters will begin in Building #12, where they will find self-paced pre-requisite courses.

Discussion

A Process for Every Task

In response to queries, Ms. Messick indicated that process is the underlying theme of training at FAI, whether that training is delivered online or in a more conventional setting. More specifically, FAI believes 1) that there is a process for every task; and 2) that processes need to be taught. That "teaching" can be formal (e.g., an instructor-led course) or informal (e.g., reading or mentoring).

The Mark of Successful Training

A discussion of what defines training as successful led to this simple conclusion: Successful training helps an employee perform an assignment, and use good business judgment. Training developed at FAI has always been competency-based.

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Distance Learning—
A Strategic Learning Initiative for the Air Force

Philip J.L. Westfall, U.S. Air Force

Session Overview

Dr. Westfall, Program Manager at the Air Force Institute of Technology, Air Force Technology Network, reviewed the different types of distance learning technologies and summarized the advantages and disadvantages of each. The Air Force Institute of Technology, a part of Air University, has been involved in distance education for a number of years through its Center for Distance Education. It was the founder of the Government Education and Training Network, a network of 17 Federal agencies who share distance education facilities, ideas, and programs.

Background

The Air Force Institute of Technology (AIT), based at Wright Patterson Air Force Base, is a graduate arm of Air University, which provides graduate, professional, and specialized education to members of the Air Force. AIT has the 19th largest graduate school of engineering in the country. Dr. Westfall created the Center for Distance Education at AIT. The center deals with course conversion, administration, and broadcasts—a cradle-to-grave approach in which the center is responsible for everything except course content. The AIT embraced distance education for the same reason that many government organizations are looking at it, because of a smaller workforce and leaner budgets, coupled with growing education requirements and the need to meet a vast number of learning objectives.

Types of Distance Learning

Dr. Westfall defined distance learning as structured learning that takes place without the physical presence of the instructor. Learning can be divided into three different categories: same place, same time learning, which can be called residence instruction; different place, same time learning, which can be called synchronous learning; and different place, different time learning, which can be termed asynchronous learning.

Synchronous distance learning technologies include audio conferencing, video teleconferencing, and interactive broadcast video, as well as audiographics and computer mediated conferencing (which can also be asynchronous). Asynchronous technologies include correspondence courses via print, audio tape, videotape, computer based, interactive multimedia instruction, and Web based instruction (which can also be synchronous). Audiographics and audio conferencing are the simplest synchronous technologies from the perspective of instructional design. Web based instruction is one of the cheapest asynchronous forms of delivery, but its disadvantage is that it cannot be too graphic-intensive.

Data Transmission Considerations

It is necessary to understand video compression technologies when thinking about what medium to choose. The standard for TV broadcasts today is analog full-motion video at 30 frames per second. This broadcast quality represents a data rate equivalent to 90 megabits of uncompressed video, and requires a full satellite transponder, which can be quite expensive. Compression technologies range from 56 kilobits per second to 20 megabits per second. The tradeoffs are between resolution and motion. At 384 kilobits per second, the resolution is low, but full motion can be experienced. A speed of 3 megabits per second provides full-motion VHS quality. To preserve every bit of information for transfer would require transmission at 90 megabits per second, but this speed is not widely used because it is very expensive. Digital compression allows for the preservation of select data so that less data is transmitted, but more rapidly. At 384 kilobits per second there is no problem with full motion; at lower rates, there will be jerkiness in the movements, which can be acceptable for certain types of telephone conferencing. For full motion capacity, 3 megabits per second is fine for most purposes, and even 1.5 is acceptable.

T1 represents telecommunication at 1.5 megabits per second over terrestrial lines. Terrestrial lines are not capable of transmission of 3 megabits per second; for that, satellite transmission is required, which employs compressed video technologies.

Benefits of Distance Learning

The benefits of distance learning include—

- Can be just as effective as resident instruction
- Offers "just-in-time" scheduling
- Saves travel time and per diem costs
- Offers the ability to reach students who could not otherwise be reached
- Can reduce backlog of training requirements
- Can offer enhanced instruction, remediation techniques, and real-time methods of communication and feedback
- Can make correspondence programs interactive
- Encourages life-long learning.

Dr. Westfall said that distance learning can offer a ten-fold return on investment at the same time that it offers a ten-fold decrease in costs. Sometimes the cost differential and ROI can be even greater.

Considerations in Choosing a Technology Based Solution

Objectives. Do not select a technology before you know what you want to accomplish, Dr. Westfall cautioned. Some objectives will be best served by providing some simple multimedia enhancements to a textbook, in a correspondence course approach. CD-ROM should only be used with large numbers of students, as the technology is too expensive for small numbers of students. CD-ROMs also have the disadvantage of taking a long time to develop, and risk being out of date quickly.

Motivation. Self pacing, which has been touted as one of the primary advantages of some new technologies, can be a disaster in some instances. The old correspondence courses were self-paced, and only 60 percent of the students completed the course. Similar results are reported for computer based instruction. Dr. Westfall recommended that required training be conducted during working, duty hours. Continuing education can be accomplished on off-hours. After working all day, it is unlikely that a student will want to go home and sit in front of the computer with a CD-ROM disk for the rest of the evening unless he or she is highly motivated.

Throughput. It is necessary to also consider throughput in making a decision about choice of media. Print is accessible to virtually everyone, but computer based instruction depends on platform availability. Interactive video conferencing may work for some situations, but for a large group, it is probably not the solution because it is impossible to see on a desktop system; and larger systems would not be available at many sites.

Learning styles. If individual learning styles are a factor, print is not a strong candidate, but computer based instruction (CBI) is.

Costs. Dr. Westfall said that the Center has found that when more than nine people need training, it is better and more cost-effective to deliver the training via satellite than to bring the students to a central location for classroom instruction. But for CBI, between several hundred and 1,000 students can be needed to make the cost of development viable. It is also important to consider the resource requirements to acquire the selected medium. Sometimes it can be necessary to stay with the current medium because the expenditure for the new technology cannot be justified.

Content. Further, not all content can be conveyed successfully in all media. When psychomotor skills are a factor, one way or two-way video is not a good choice, Westfall said. Laboratories or special facilities can also be difficult to replicate using video. It is difficult to observe performance of either the instructor or the student in these situations. And there may be others reasons that a student would need to be in residence, for instance to have access to research or laboratories or libraries. Other times residence instruction may be mandated.

Learning outcomes. Dr. Westfall believes there is no significant difference in learning outcomes if appropriate media are used. Be skeptical of claims that students learn 50 or 60 percent more with one medium than with another, he said. The outcome of the learning largely will be based on prior knowledge and intrinsic motivation. Dr. Westfall's research shows that these two variables have a .78 correlation with the ability to learn. Do not expect dramatic improvements in learning outcomes because of the media you choose to deliver the training. Media choices can affect the time the learning takes however. CBI, for example, allows the student to go right to the material he or she needs to learn, which can dramatically shorten course or learning time.

Interactivity. It is prudent to also be wary of the myth that the more interactivity in the learning, the better. In general, interactivity can be helpful, but recent research shows that it does not have a significant impact on learning outcomes. However, there is research that suggests that interactivity has a statistically significant impact on the students' perceptions of their learning

experience. Most students want more interactivity. But some like asynchronous learning better. For example, a study at Rensselear Polytechnic Institute found that engineers wanted to go off in a corner to digest the material on their own. A distance learning course should not be judged on how interactive it is without consideration of other factors as well.

Overall effectiveness. Dr. Westfall offered the following chart as a "think piece" to facilitate thinking about which medium to choose. It is not possible to just average the advantages, he said. The solution will be complicated by individual factors and should be made carefully for the individual organization's specific needs and learning objectives. Beware of software that offers to automate the entire process of choosing the medium. Many of these products are designed by multimedia companies and they are biased in favor of computer based instruction for that reason.

Distance Learning Media
Factor Comparison

Factors	Print	CBI	WWW	ITV/VCT	Resident
Self Pacing	A	B	A	D	D
Optimal Pacing	C	C	C	A/C	A/C
Throughput	A	B	B	A/C	D
Individual Learning Styles	D	A	A/D	C/C	
Face-to-Face	D	D	D	C/B	A
Collaborative Learning	D	A/D	A/D	C/B	A
Travel	A	A	A	A	D
Currency	C	D	A	A	A
Technical Problems	A	B	C	B	A
Development Cost/Time	A	D	B/D	A	A
Review	A	A	A	C	C
Consistency	A	A	A	B	C

Key: A-D: Effectiveness

Why the Air Force is Using Interactive Broadcast Video

Requirements. At times the Center has been given orders to translate media within 90 days to meet large-scale learning objectives. This is especially true in government acquisitions, which is a field that is changing rapidly as Congress mandates new laws. The Air Force needed a medium that would allow it to preserve the academic quality of the instruction, offer interactivity, allow for frequent content changes, and allow for inter-operation with other government agencies.

Interactive broadcast video. The Air Force chose interactive broadcast video because it was cheap, fast, and effective. Because most of the material to be converted was lecture based, this medium offered the easiest conversion option.

In evaluating courses, the Air Force found that 90 percent could be presented via satellite. At times, the Center will use a combination of both two-way video and one-way video. By hooking up satellite delivery to video teleconferencing systems, guest speakers can be incorporated into the broadcast.

One-way vs. two-way video. Dr Westfall said some people believe that if one-way video is good, two-way video is better, but this is not usually the case. Two-way video is expensive and does not meet many of the needs of the Air Force. There is no difference in learning outcomes between one- and two-way video. Two-way video actually offers some disadvantages: the student is focused on the instructor, and the student is being watched by the instructor. With one-way video, the students are free to facilitate their own learning more. In addition, with two-way video, the advantages decrease in proportion to the number of sites. If there are 10 sites, the instructor can only watch one class one tenth of the time.

One-way video also offers advantages in throughput. There can be an unlimited number of sites with no limits caused by bridging systems that two-way video required. Two-way video systems can also cause problems in compatibility among the different locations if the equipment is not all the same.

The Air Force Technology Network

The Air Force Technology Network (ATN) has four uplink facilities: at Wright Patterson, Maxwell, Keesler, and Sheppard Air Force Bases. The system is being expanded to Europe, Japan, and Guam through downlink facilities at these locations.

Production can be done both from a studio and from the classroom. Dr. Westfall favors the latter, which he says is more informal and simpler. Instructors are trained on the basic protocols. Transmission is at 3 megabits per second. Downlinks are 1.8 to 2.4 meter dishes. An audio conferencing system in which the student pushes a button to talk is used. The types of courses vary broadly. The system has delivered to as many as 3,000 students at one time.

The Government Education Training Network (GETN)

The GETN has evolved into a government-wide network that includes 950 General Services Administration sites and 12 uplinks. Current planning is to expand to 1,200 sites. In the future the center anticipates more interagency program sharing, and the capability to send data over satellite into file databases. This will be faster than using the Internet to send files.

Discussion

Dedicated Learning Environment

learning environment is needed. Dr. Westfall was adamant in expressing his belief that learning

at the workspace will be slow and fragmented, because the student is trying to do too many other things.

Another participant asked if there were dedicated group facilitators at the downlink sites.

Westfall answered that it depended on the course. Some facilitators have been trained in residence for the long term.

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